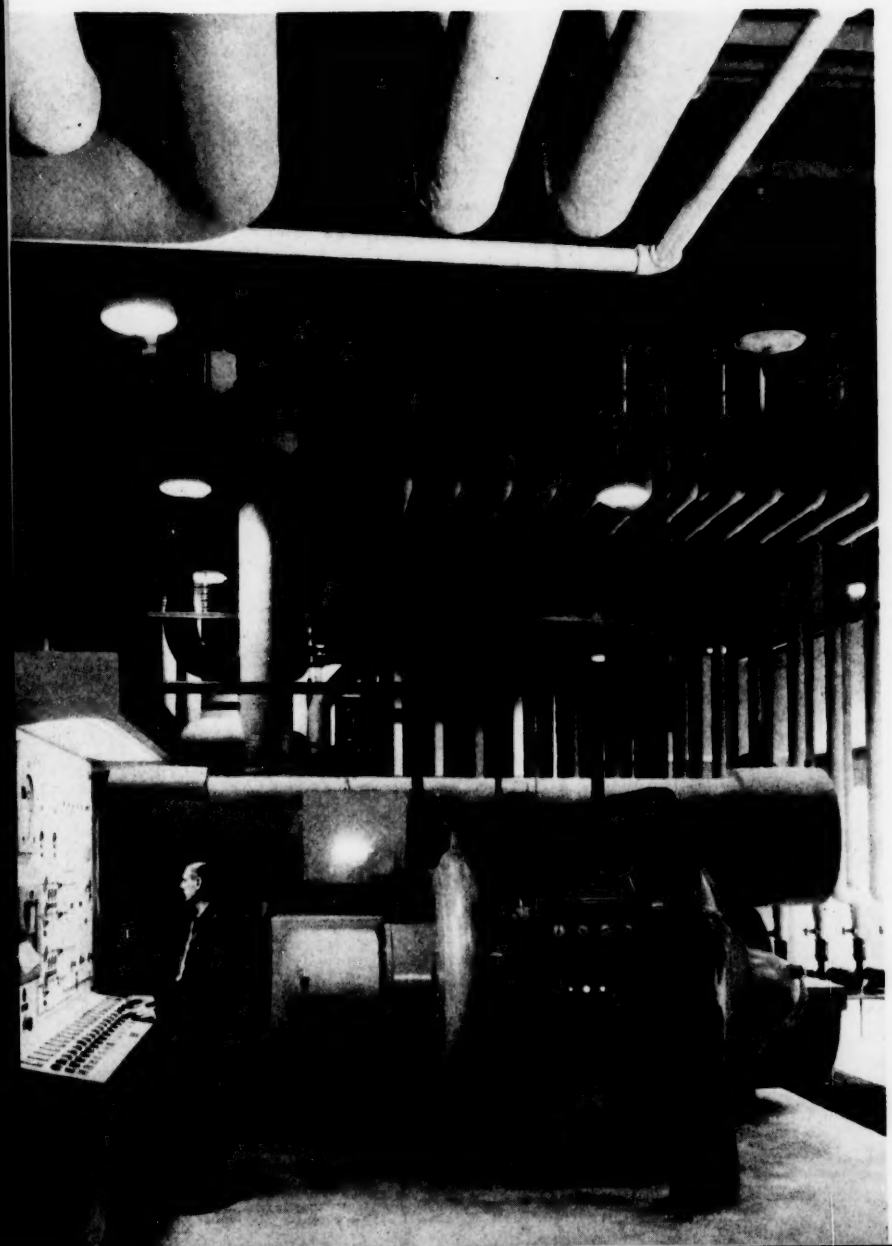
INDUSTRIAL REFRIGERATION

MAY
1958

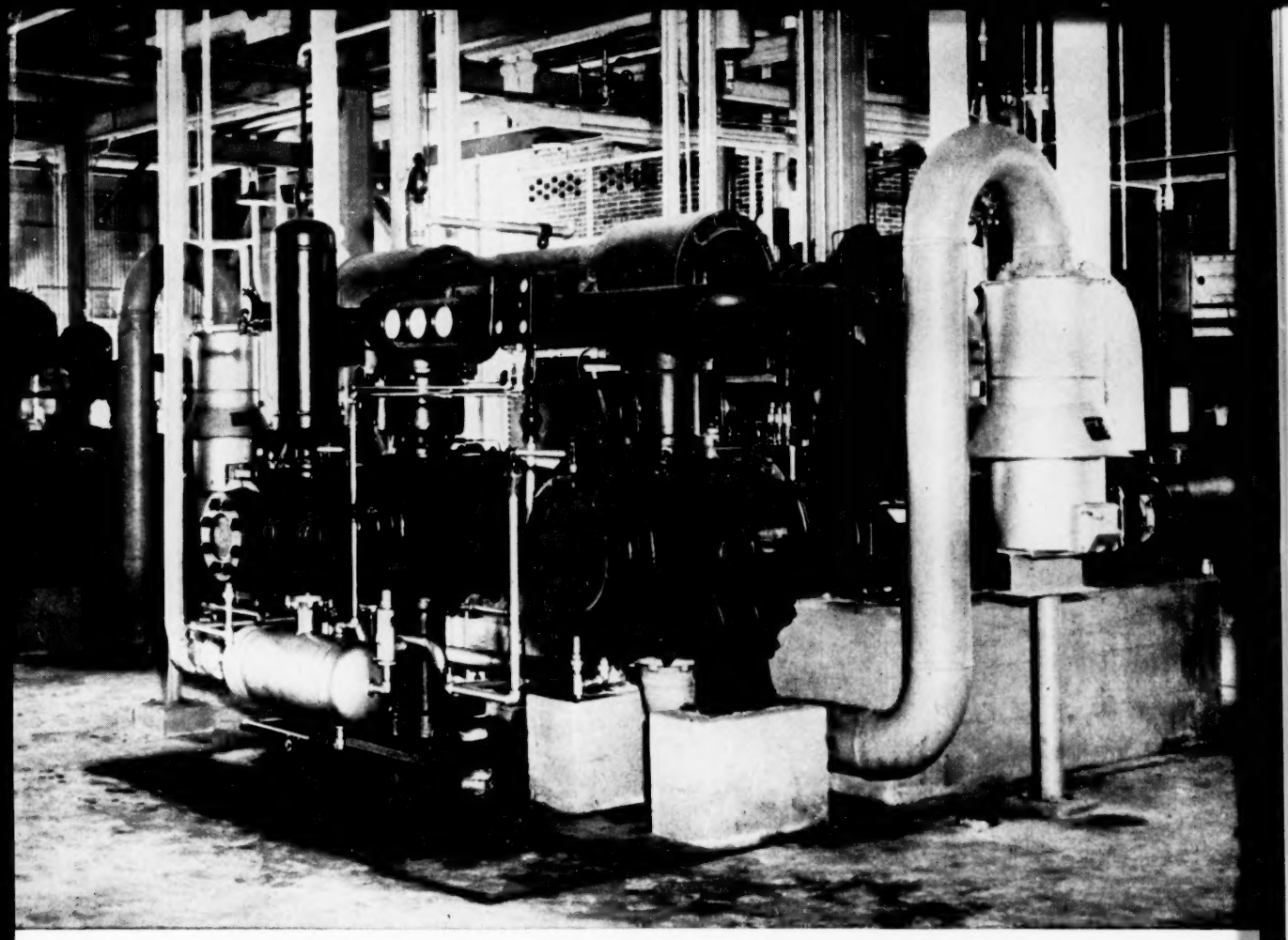
Vol. 134, No. 5



Railroads Terminal Gives Place To New Frozen Food Terminal

Materials Handling By Improved Methods Not Affected By Cold

Cover – Heat Pump For Utility Building Group Completed At Spokane



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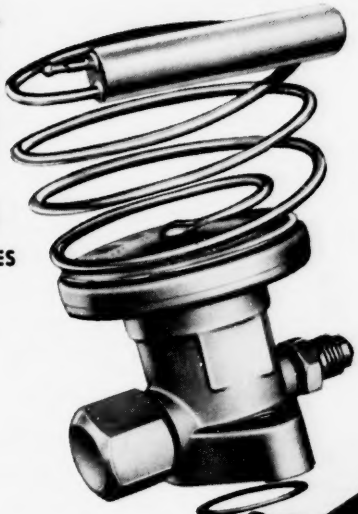

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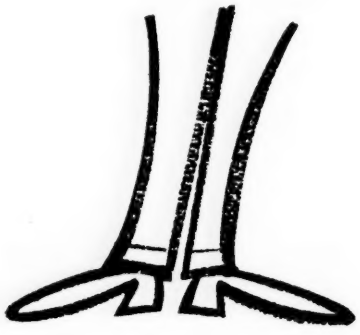
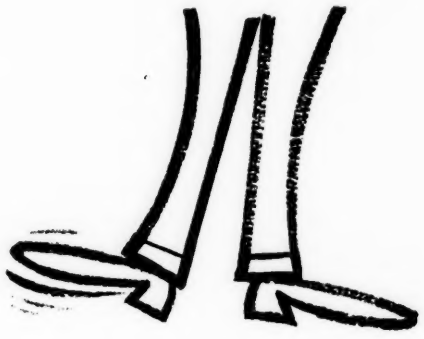
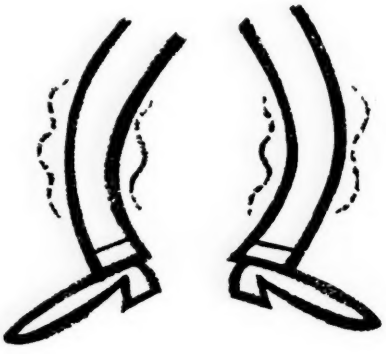


March—Began buying lower grade ammonia at bargain price . . .

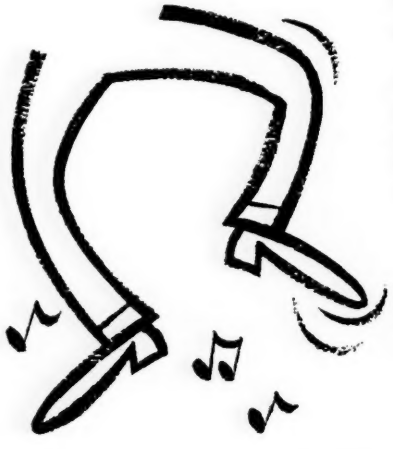


Later—Non-condensable gases formed, head pressure up . . .



Still later—Too much moisture, float valves frozen . . .

Too late—Cooling room temperature up, lost day's production . . .



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May, 1958

Number 5

Vol. 134

Industrial Refrigeration

Now in its 67th Year of Publication

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Responding to requests from refrigerated warehousing, brewing and real estate renting enterprises, from milk and ice cream producers, chain grocery organizations, equipment and refrigerant manufacturers, this feature is a reprinting of a 1955 paper.

Service and Research; Warehousemen's Objectives . 11

Meeting private construction and operation with more specialized services, and backing up their sales contentions with both product and operational research, is the '58-59 plan of NARW.

Modern Frozen Food Distribution Center 13

California Consumers erects one-story refrigerated warehouse for its subsidiary, the Los Angeles Cold Storage Co. Operational advantages, first cost considerations, future plans, and rapid construction gimmicks, among factors weighed.

Automatic Defrost Systems 17

Automatic defrosting is only a portion of a much broader subject: economy in first cost, ease of maintenance and efficient operation of the entire refrigerating cycle. The whole is the sum of its parts; this defrosting discussion concerns the whole.

Materials Handling Factor . . . Humidity 34

Practically any kind of materials handling equipment, with care, preparation and proper maintenance, can be successfully operated in the abnormally low temperatures imposed by present-day food preservation methods. Or to put it another way, a concern's handling technique can be just as modern as its refrigerating methods.

Milk Concentrates 39

Two announcements on development of re-constitutes, preserved for short periods at cooler temperatures, were made in March.

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The Cover:

Refrigeration has made the most significant contribution to fuel conservation in the past several decades, said a speaker at the American Power Conference, 1957. Another installation to prove his point is this half of a two-unit 800-ton heat pump serving a four-building group at Spokane, Washington.

Published Monthly by NICKERSON & COLLINS CO.
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HOW DANGEROUS IS AMMONIA?

Almost weekly these questions come up, "Will it explode", "Will it burn", "Can it suffocate"? Well . . ., does it?

K. M. HOLADAY
Utilities Distribution Engineer
Anheuser-Busch, Inc.

»» IS THERE a real danger of ammonia explosion with a refrigeration system? Is there a real health hazard from ammonia vapors in a well-operated plant? The following remarks are intended to summarize some published data and to indicate reasonable answers to these questions.

Fifty years ago a refrigeration textbook stated[1], "It appears that the dangers of ammonia in case of fire have been greatly over-rated, and at least in the beginning of a fire it acts as an extinguisher rather than otherwise."

Fire Hazard Small

In 1942, the NAPRE Operating Data Book contained the statements[2], "In its pure state, it requires temperatures of 1200 to 1500 F to make it (ammonia) inflammable. This might be done in a laboratory but not in a refrigeration piping system." This further statement appears in the 1945 NAPRE Operating Data Book[3]: "Under normal conditions ammonia will burn in air only while in contact with a flame. If the flame is removed, the ammonia stops burning. Ease of combustion may be increased by higher pressures, higher concentrations of oxygen, or by the addition of catalysts. The fire hazard of ammonia may be said to be extremely small."

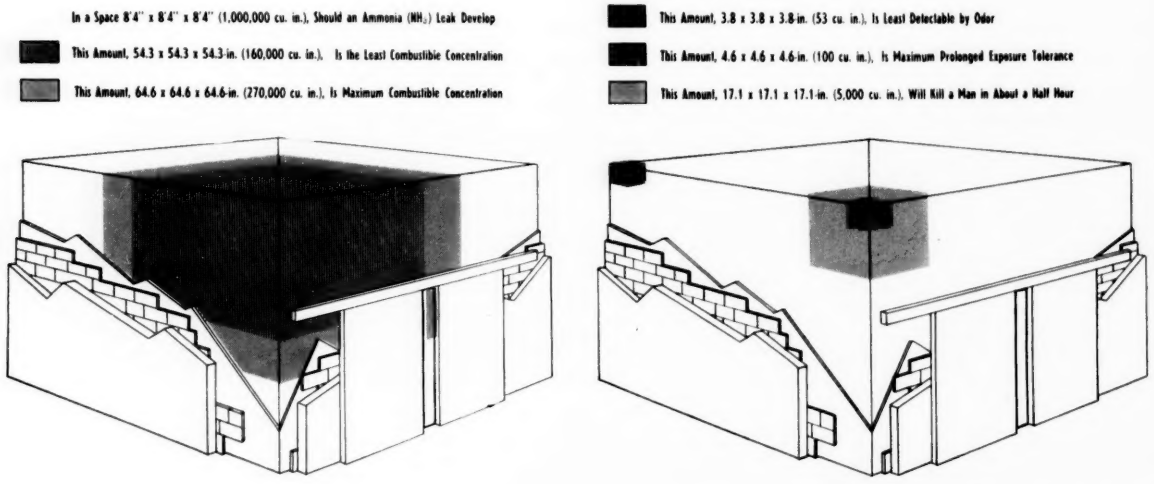
Reprint requests for this paper following publication of the March '58 *Industrial Refrigeration* account, "Blast Rocks Richmond", far exceeded the supply. Reprinted here, a quantity of two-color reproductions have also been stocked as an industry service. Safety committees of various associations and firms intending use for personnel instruction, may obtain a number at nominal cost. While not near as lethal as often implied by the press in accident reports, ammonia as a refrigerant *carries the same hazards as all compressed gases.* Users should be thoroughly familiar with such potential, plus the toxicity hazards.

According to the U. S. Bureau of Mines, ammonia can burn[4] when mixed with air in concentrations of more than 16 and less than 27 percent ammonia by volume (See Fig. 1). This is confirmed by the observation of welders[5] making emergency repairs with escaping ammonia impinging on the welding flame. They reported that the ammonia vapor would burn in the flame of the torch, but would not continue to burn after the torch was extinguished.

Paper given before St. Louis Chapter NAPRE, 1954.

A few years ago a "disastrous ammonia explosion" was reported in New York City. However, investigation revealed[6] that the explosion was in a steam boiler using powdered fuel, and that the nearest ammonia was in a refrigeration system across the street from the explosion.

There have been explosions in ammonia systems, but these can nearly always be attributed to oil mist or vapors. Some time ago the telltale pipe on an accumulator in a brewery refrigeration system had to be replaced. The Chief Engineer[7] recognized the possible hazards. That section of the system, including the accumulator and connecting headers, was thoroughly pumped out and then purged with air. As an added precaution, the bonnet was removed from an 8-inch valve on the header nearby, and the open valve body was covered with a piece of cardboard. Almost as soon as the torch was applied to cut off the telltale pipe the vapor in the accumulator exploded and the cardboard plate on the valve body relieved the system sufficiently to prevent any damage. In this case the explosion might have been attributed to ammonia if the system had not been so completely purged. Actual cause seems to have been vapors from an oil coating on the inside surface of the accumulator.


In a Space 8'4" x 8'4" x 8'4" (1,000,000 cu. in.), Should an Ammonia (NH_3) Leak Develop
This Amount, 54.3 x 54.3 x 54.3-in. (160,000 cu. in.), Is the Least Combustible Concentration
This Amount, 64.6 x 64.6 x 64.6-in. (270,000 cu. in.), Is Maximum Combustible Concentration
This Amount, 3.8 x 3.8 x 3.8-in. (53 cu. in.), Is Least Detectable by Odor
This Amount, 4.6 x 4.6 x 4.6-in. (100 cu. in.), Is Maximum Prolonged Exposure Tolerance
This Amount, 17.1 x 17.1 x 17.1-in. (5,000 cu. in.), Will Kill a Man in About a Half Hour

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GENETRON 12 WHITE LABEL CCl_2F_2
Dichlorodifluoromethane

GENETRON 22 GREEN LABEL $CHClF_2$
Monochlorodifluoromethane

GENETRON 113 PURPLE LABEL $C_2Cl_3F_3$
Trichlorotrifluoroethane

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40 Rector Street, New York 6, New York

Hydrogen has been mentioned as a possible cause of explosions in ammonia refrigeration systems[8]. This usually takes a much higher temperature than exists anywhere in a refrigeration system, but it is conceivable that oil vapors, or the hot metal in compressor cylinders may catalyze the reaction. Even if this does take place, there should be no dangerous accumulation of hydrogen unless the purging of non-condensible gases is neglected.

Real Toxic Hazard

An ammonia hazard that is more real than the danger of fire and explosion is its toxicity. Familiarity with the odor makes it easy to overlook the possible danger of prolonged exposure to substantial concentrations of the vapor. Ammonia is more toxic than any of the common refrigerants.[9] A comparison of the lethal concentrations and exposures is indicated in Table I. The physiological effects of breathing various concentrations of ammonia vapor are indicated by Table II.

Observance of these practices will go a long way toward eliminating refrigerating plant catastrophes.

The difference between a fatal concentration and the least amount that can be detected by odor may be visualized by assuming a cubical space of 100 inches (8.3 ft.) in each dimension. This will contain 1 million cubic inches, and a volume of 53 cubic inches, or a cube with 3.8" sides, will represent the amount of ammonia that can just be detected by odor. A cube of only 17.1" sides will contain 5000 cubic inches, or an amount which may kill a man on short exposure (see Fig. 2).

Table I—Toxicity of Common Refrigerants

Refrigerant	Duration of Exposure	Lethal (°) Concentration % by volume Vapor in air
Ammonia	½ hr.	0.5
Sulfur dioxide	5 min.	.7
Methyl Chloride	2 hr.	2.0
"Freon-11"	2 hr.	10.0
"Freon-22"	½ hr.	10.2
"Freon-12"	2 hr.	28.5
Carbon dioxide	½ hr.	29.0

(°) to guinea pigs.

Table II—Effects of Breathing Ammonia

Physiological Response	Ammonia ppm by volume in air (°)
Least detectable odor	53
Max. allowable, prolonged exposure	100
Max. allowable, ½-1 hr. exposure	300-500
Immediate throat irritation	408
Immediate eye irritation	698
Coughing	1720
Dangerous, ½ hr. exposure	2500-4500
Fatal, short exposure	5000-10000

(°) 10,000 ppm = 1%

Table III—Min. Ventilation Capacities for Refrig. Mach. Rooms

Weight of Refrigerant in System lb.	Mechnical Discharge of Air cfm.	Duct Area Sq. Ft.	Area of Window or Door Sq. Ft.
20	150	¼	4
50	250	⅓	6
100	400	½	10
500	1275	1¼	22
1000	2050	2	31
5000	5500	4½	62
10000	9500	6½	90
20000	15200	8¼	130
30000	18200	9	145

Safety Precautions

The refrigerating engineer can minimize the hazards of ammonia by practicing the following precautions:

1) Purge the system continuously, or at sufficiently frequent intervals to avoid any accumulation of non-condensible vapors.

2) When welding repairs are necessary, pump out system, ventilate, and provide ample area for pressure relief in case oil vapors cannot be completely eliminated.

3) Reduce leakage to a minimum.

4) Provide ammonia gas masks, and train men how to wear them properly.

a) There should be a sufficient number of masks for all employees who may have to enter contaminated areas.

b) The masks should be conveniently accessible in locations not likely to be severely contaminated.

c) The masks should be periodically inspected to insure good mechnical condition, and to make certain that the chemical canister has ample absorbent capacity.

d) Men should periodically practice wearing the masks, so that there will be no mistakes or delays when emergencies arise.

5) Provide adequate means for quick and effective ventilation. Table III is an abbreviation of data specified in American Standard ASA B9.1—1953,[11] Safety Code for Mechnical Refrigeration.

References

(1) J. E. Siebel, Compend of Mechanical Refrigeration 6th Ed., Nickerson & Collins, Chicago, 1904.

(2)-Robert C. Doremus, Quiz Answer No. 2, NAPRE Operating Data Book, NAPRE, Chicago, 1942.

(3) G. B. Bachman, Purdue University, NAPRE Operating Data Book, p. 89, NAPRE, Chicago, 1945.

(4) U. S. Bu. of Mines Bull. 279, 1928, cited in Penn. Salt Mfg. Co. Data Book AR 551, 1944.

(5) H. W. Becke, unpublished report of experience.

(6) R. T. Brizzolara, "Is Ammonia the Cause of Refrigeration Plant Explosions?" Refrig. Eng., Nov. 1951.

(7) H. W. Becke, loc.cit.

(8) R. T. Brizzolara, loc.cit.

(9) Refrigerant Tables, Charts, and Characteristics, Amer. So. Refr. Engr., New York, 1950.

(10) From Henderson & Haggard, Noxious Gases, Chemical Cat. Co., New York, 1927, cited by Penn. Salt Mfg. Co. Data Book AR 551, 1944.

(11) ASRE Sponsored ASA., Safety Code for Mechnical Refrigeration, New York, 1953.

How to Cut Refrigeration Costs and Increase Capacity with Better Purging

If you don't have an Armstrong Purger, chances are your head pressure is 10 to 40 lbs. above theoretical—because all the non-condensables are not being removed from your system. Have you checked your pressure lately?

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Less Refrigerant Used
"$500 annual ammonia saving"—Howard Johnson Ice Cream Mfg. Plant, Baltimore, Md.

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Safety and dependability are assured by the design of the Armstrong Purger. Its forged steel construction can withstand over 2000 lbs. hydraulic pressure. Working parts are stainless and heat-treated chrome steel.

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Indianapolis, Indiana	Wm. Lynn Chemical Co., Inc.	St. Louis, Missouri	Barada & Page, Inc.
Kansas City, Missouri	Barada & Page, Inc.	Sioux City, Iowa	Kennedy & Parsons Co.
Kansas City, Missouri	The Creamery Package Mfg. Co.	Tulsa, Oklahoma	Barada & Page, Inc.
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news briefs of the month

New Bank Service in Cerebro-Spinal Fluid

Watery substance which flows in the closed circuit through the cavities of the brain and in the spinal column is now preserved by freezing at low temperatures. This latest addition to the field of surgical "banking" is a development of Dr. Harold C. Voris, Mercy Hospital, Chicago. An important use of the fluid is to replace that lost in operations on the brain and spinal column, and to irrigate an operative field so that the surgeon's vision is clear at all times.

Australian Institute Sponsors Exhibition

Receiving congratulations this month on the first Australian Refrigeration and Air Conditioning Exhibit and Convention are its sponsors, Australian Institute of Refrigeration, Inc., N.S.W. Div. Held in conjunction with the Annual Federated Conference at the Sidney Showgrounds May 5-9, it is expected to attract 20,000 people. The convention features both commercial and technical sessions.

New ARI Standards On Cooling Towers

Number 910-57, a new Standard for Mechanical-Draft Water-Cooling Towers for Use with Air-Conditioning and Refrigeration Equipment, has been issued by the Air-Conditioning and Refrigeration Institute.

Disaster Drills Urged By NARW

Planning of, preparing for, and staging a disaster drill are the three principal points made in a safety committee bulletin issued in April by the National Association of Refrigerated Warehouses, Inc. Prepared by R. W. Davis, Union Ice Company, San Francisco, the bulletin points out the utmost importance of safety-minded, well trained personnel who can execute proper steps to bring disaster under control when it occurs. Reprints of "How Dangerous is Ammonia?" revised in this issue, should be required reading for safety or disaster training.

Western Exhibit and Conference

A comprehensive program of technical sessions has been announced by the Western Air Conditioning Industries Association in conjunction with its Air Conditioning, Heating, Ventilating and Refrigeration Exhibit at the Shrine Exposition Hall in Los Angeles, May 7-11. Second conference for WACIA, the event will hereafter be held every other year so as to fall in alternate years with another national show being held bi-annually in the industry.

AEC Excludes Food Irradiation

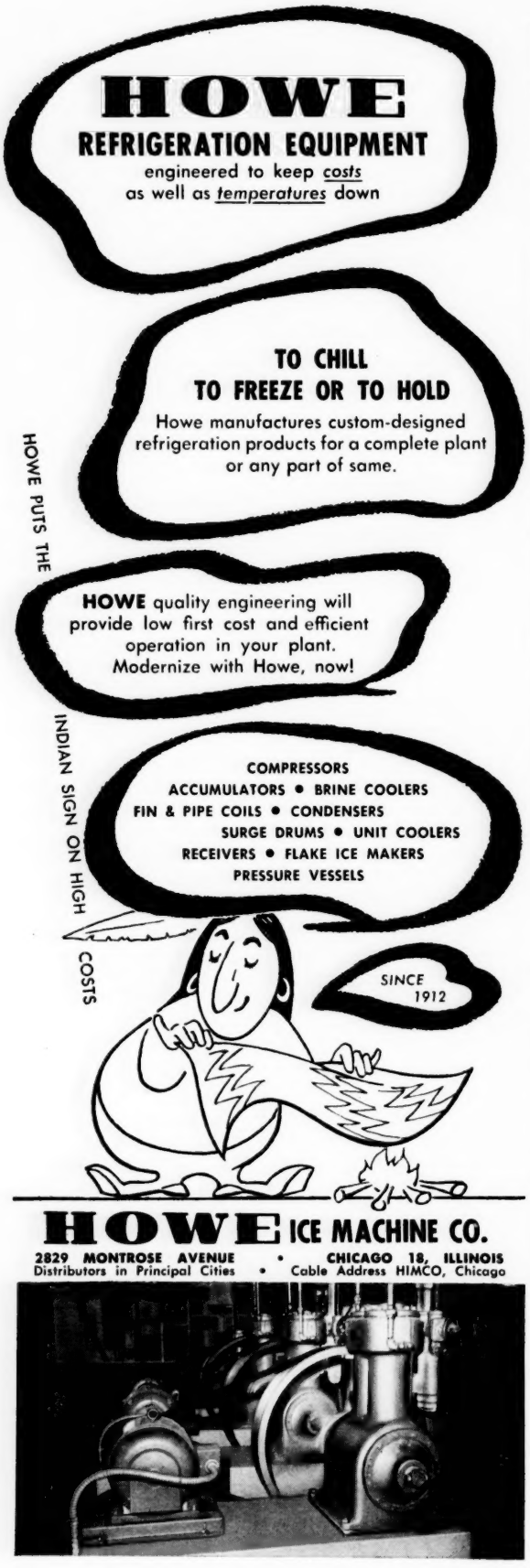
Although the Atomic Energy Commission invited proposals for study of applications of high-level nuclear radiation in industrial operations, the food industry was specifically excluded. Invitations included study in drug, chemical, plastic and other industries. Reasoning behind food exclusion is the fact that the Army Quartermaster Corps is already studying the use of radiation in this field.

Low Temperature Aircraft Materials

Next ten year goals for physical properties of materials used in aircraft and missile construction will see the temperature range expanded upward to 4,000 F, and downward to minus 450 F. This announcement was made recently by the Aircraft Research and Testing Committee and the Manufacturing Committee of the Aircraft Industry Association. Use of special liquid propellants for missiles emphasizes the importance of good low temperature properties. Failures of some missiles under test have been attributed to valves freezing up at minus 260 F.

Erroneous Description In 33-Foot Ceilings

Readers of March IR doped out the ceiling height for the Canadian Frozen Food plant reported on page 17, as being 33 feet. Total volume of the frozen food plant, including engine rooms, offices, platforms, etc. is 520,000 cu ft, as reported. Goods, however, are piled only 20-ft high so the capacity would be only 320,000 cu. ft.



NARW Safety Awards

Five Years

Beall Refrigerating Co., Santa Clara, Calif.
The Mowery Cold Storage, Mechanicsburg, Pa.
National Ice & Cold Storage Co., Stockton, Calif.
Polar Cold Storage Co., Sioux Falls, S. Dak.
Tyler Warehouse & Cold Storage Co., St. Louis, Mo.

Four Years

Germantown Cold Storage Company, Inc., Germantown, N.Y.
U.S. Security Warehouse, Inc., Columbus, Ga.

Three Years

American Ice & Cold Storage, Inc., Everett, Wash.
Duluth Terminal & Cold Storage Company, Duluth, Minn.
Eastern Market Cold Storage Co., Detroit, Mich.
Lyndonville Ice & Cold Storage, Lyndonville, N.Y.
Sharon Coal & Ice Co., Farrell, Pa.
Turlock Refrigerating Co., Turlock, Calif.
Union Ice & Storage Co., Mountain View, Calif.
West's Ice & Cold Storage Co., Fond du Lac, Wis.
Madison County Cold Storage, Canastota, N.Y.

Two Years

Arctic Ice & Cold Storage Co., Buffalo, N.Y.
Bakersfield Ice & Cold Storage Co., Bakersfield, Calif.
Birmingham Terminal Cold Storage Co., Inc., Birmingham, Ala.
Butte Warehouse & Cold Storage Co., Butte, Mont.
Colonial Ice Company, Savannah, Ga.
Empire Cold Storage Co., Spokane, Wash.
Greeley Ice & Storage Co., Greeley, Colo.
Jones Cold Storage Corp., Norfolk, Va.
Lancaster Ice Manufacturing Co., Lancaster, Pa.
Mid-City Cold Storage Co., Chicago, Ill.
Modern Freezing & Storage, Inc., Corvallis, Ore.
National Ice & Cold Storage Co., Riverside, Calif.
Newfane Storage Corp., Newfane, N.Y.
Puyallup Ice Co., Puyallup, Wash.
Union Ice Company, San Francisco, Calif.
Wilson Cold Storage Co., Wilson, N.Y.

One Year

Arctic Cold Storage Co., Inc., Philadelphia, Pa.
Booth Cold Storage Co., Chicago, Ill.
Butler's Warehouses, Inc., Brooklyn, N.Y.
Carlisle Hygienic Cold Storage Co., Carlisle, Pa.
Commercial Storage Co., Memphis, Tenn.
Continental Freezers of Illinois, Inc., Chicago, Ill.
Crosby Cold Storage Co., Inc., Olean, N.Y.
Geneva Refrigerating Corp., Geneva, N.Y.
Great Lakes Terminal Warehouse, Toledo, Ohio
Hartford Freezer Corp., East Hartford, Conn.
Higley Cold Storage, Inc., Mason City, Iowa
Jax Ice & Cold Storage Co., Jacksonville, Fla.
Kansas Cold Storage, Inc., Wichita, Kans.
Kenyon Zero Storage, Granview, Wash.
Klamath Ice & Storage Co., Klamath Falls, Ore.
Little Rock Cold Storage Co., Little Rock, Ark.
Marionville Refrigerating Co., Marionville, Mo.
Manhattan Ice & Cold Storage, Inc., Manhattan, Kans.
New England Cold Storage Co., Portland, Maine
New England Cold Storage & Warehouse Co., Lawrence, Mass.
New Haven Cold Storage & Warehouse Co., New Haven, Conn.
Oshkosh Storage Co., Inc., Oshkosh, Wis.
Patterson Cold Storage, Jacksonville, Fla.
Piedmont Cold Storage Corp., Charlotte, N.C.
Quincy Market Cold Storage & Warehouse Co., Gloucester, Mass.
R & M Cold Storage, Worcester, Mass.
Rahal Cold Storage, North East, Penna.
Roanoke Ice & Cold Storage, Roanoke, Va.
Scottsbluff Ice & Storage Co., Scottsbluff, Nebr.
Standard Ice & Fuel Co., Charlotte, N.C.
The Union Ice Co. plants at Hayward, Napa, Oakland, Santa Cruz, and Stockton, Calif.; and Reno, Nev.
United States Cold Storage Corp., Kansas City, Mo.
U.S. Growers Cold Storage Co., Inc., Los Angeles, Calif.

(Note—February '58 *Industrial Refrigeration*, page 23, carried the 1956-57 list of firms cited for NARW safety awards. It is regretted that the 1957-58 list published here was inadvertently switched with the one published in February. That's what can happen when the Editorial Dept. starts checking current lists against past ones. Sorry for the mix-up—J.R.K.)

Record Breaking Attendance and Agenda for 67th Meeting

General officers elected at the annual meeting of AWA are, l. to r., Vice-president C. J. Lamothe, St. Louis, Treasurer W. A. Morse, Minneapolis, and President Gilbert J. Stecker, Louisville.

Officers of NARW elected at Dallas are l. to r., Treasurer A. R. (Gus) Carstensen, Sacramento, President Philip G. Kuehn, Milwaukee, and Vice-president W. C. (Bill) Baker, Chicago.

Service Economic Research | Warehousemen's Objectives

»» OUTSTANDING achievement of the Refrigerated Warehouse Division during the 67th annual convention of the American Warehousemen's Association, Dallas, Texas, March 10 to 13, is the decision to undertake an economic research program. Although some 14 major resolutions were adopted by the public refrigerated warehousemen, concerning both legislative and executive government activities, the spontaneous acceptance of the recommendations of the Special Operations' Research Committee to determine the place of public refrigerated warehousing in the food distribution economy, was the more important item of business.

The AWA general sessions and the NARW meetings presented the usual impressive array of speakers. On sales and service topics were the renowned Elmer (Sizzle) Wheeler of Dallas, said to be the world's greatest salesman, and the Association's own General Secretary, William Dalton. On business and economics, the program presented Joseph F. Leopold, Dallas, National Associated Businessmen, Inc., Samuel B. Shapiro, Chicago, Linen Supply Association; and George B. Rullman, a CPA of Hastings, Nebraska on tax interpretations.

In the government arena were such speakers as J. Lewis Powell, Office of the Assistant Secretary of Defense, The Pentagon; Major General H. R. MacKenzie, and John A. Hawkins, NARW Honorary Member, Military Subsistence Supply Agency, Chicago; J. Robert Idol, Cincinnati, Commodity Specialization Service; and, Don S. Anderson, Live Stock and Dairy Division, USDA, D.C. Featured speaker on a labor topic was Desmond Barry, President, Galveston Truck Lines, Houston, Texas.

One whole business session was taken up with the usual area business surveys by chapter chairman, followed by standing committee reports. Safety, insurance, government affairs, industrial relations and two warehouse operations committees submitted annual summaries. Winding up the business meetings was the annual election of officers.

Social program for the 67th AWA meeting consisted of a welcome reception, City Club, Monday, a "Night in Texas" on Tuesday, Wednesday open, and the President's Reception followed by the annual dinner party on Thursday. Ladies program was headed up by Mrs. S. A. Kadane and Miss Mary Nell Weatherred, co-chairmen. G. K. Weatherred, past general president, AWA, and S. A. Kadane, president NARW, co-chairmanned the general convention committee.

Operations Highlights

Object of Economic Research Program is to determine trends and needs of packers, shippers, distributors and marketers of perishable products and where the public refrigerated warehouse can best serve in food distribution pipe line. Program, financed by voluntary subscribers from NARW member companies, will employ the services of Midwest Research Institute, Kansas City. Enthusiasm expressed for the research program reminded many convention delegates of a similar activity more than 15 years ago when the NARW inaugurated the Refrigeration Research Foundation to advance the art of refrigerating commodities.

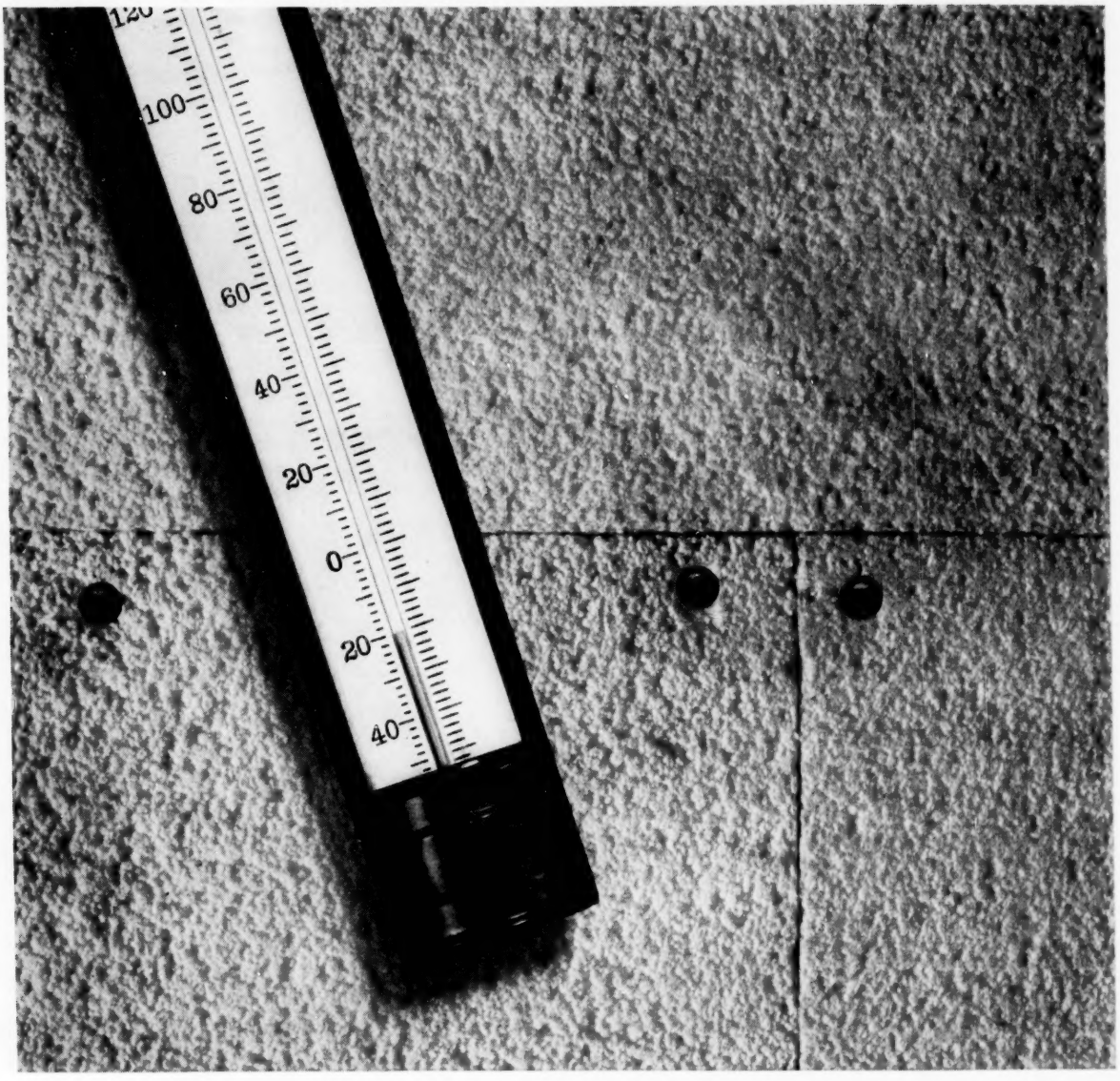
Surprising service item coming out of the Dallas meeting was a report that an increasing number of warehouses are adding frozen foods delivery. According to one recent survey almost ten percent of the refrigerated warehouses now provide such service.

Although occupancy of cooler and freezer space is below that of a year ago, many public warehouses are still adding to their plants, especially in freezer space. A survey indicated expectation of more than 350,000 cu. ft. of freezer construction during 1958.

Another special committee reporting at the Dallas meeting was the truck detention committee. Middle Atlantic Conference of Motor Carriers in 1957 adopted a detention rule which worked a hardship on refrigerated warehousemen. Working with representatives of other affected industries the NARW committee succeeded in securing modifications.

William Dalton, admiring badge of office conferred on him by the Texas Host Committee, was reappointed AWA General Secretary and Executive Vice-president of NARW. It was Dalton's 10th Anniversary in these positions and he was presented with luggage in recognition of his services.

CLOSE-UP OF A MODERN COLD ROOM INSULATION



Stable new Armstrong Armalite

holds its dimensions within .072" per 3' length at 20° below

Shrinkage of Armalite at low temperatures is negligible. The 3' long foamed plastic boards will contract only .072" when temperature is pulled down 100°, from 80° to minus 20°. But that low shrinkage figure tells only half the story. Armalite also has resilience, or "bounce." It can be applied under slight compression. On the job, any slight contraction at low temperatures is compensated for by the "spring back" of the compressed Armalite. Joints stay snug and insulating efficiency high. Other advantages include light weight, high strength, good moisture resistance . . . all at a reasonably low cost.

These are just the highlights. For details, send today for the free folder, "Armstrong Armalite." Write to Armstrong Cork Company, 2105 Skye Drive, Lancaster, Pa.

Armstrong INSULATIONS

METROPOLITAN FROZEN FOOD DISTRIBUTION CENTER

Considerations By Los Angeles Cold Storage Co. In The Construction of Their New Central Plant

By REGIS GUBSER
GEORGE PAULICK

»» PASSING of an old Los Angeles landmark and its replacement with a new one displayed once again the inevitable march of time. A modern 2,000,000 cu ft sub-zero public warehouse built by California Consumers Corp. for its wholly-owned subsidiary, the Los Angeles Cold Storage Co. replaces the site of what was, in its heyday, the terminus of the Far West's transportation system. Originally occupied by the old Union Station, the same plot of ground was also the western home of the historic Wells-Fargo Express Co.

Replacement of some existing facilities, along with an expansion program decided the acquisition of this property, nearly six acres, by California Consumers Corp. Balance of this plot is now owned by another old firm, Youngs Market Co.

Very central in location, the site was made doubly attractive for a cold storage building because of its proximity to another Los Angeles Cold Storage Plant which is on the adjacent corner (the multi-story structure visible in subject photo).

Factors Governing Design

Before making any final decision as how to best utilize this area many preliminary plans and cost estimates were made. Points given most consideration were

1. Location of building for maximum utility of land and existing facilities,
2. Multiple story vs. single story,
3. Capacity and future expansion,
4. Method of refrigerating,
5. Maximum customer service,
6. Minimum operating cost,
7. Economies of construction, and
8. Elapsed time of construction.

Building location required a number of plot plans to visualize the most desirable arrangement. Layouts having the loading dock facing the public streets provided maximum space within the building, but were ruled out due to the difficulty of backing in trucks off the main thorofares. Final decision came when it was learned that Youngs Market Co. intended to leave a 48-ft wide strip of land vacant between their building and LACS' south property line.

Access and Future Plans

Plan finally selected provided that a truck loading dock be located 75 feet north of the south property line, which resulted in a private street 231 feet wide between the two buildings. An excellent area for the largest trucks to maneuver back to the dock, it also provides plenty of parking space for customers and employees. Choosing this plan allowed for a building 300 x 380 ft, which leaves nearly one half the land for future building.

Operational Considerations

In determining the type of building to be erected, the dominant factors considered were the usage of the warehouse and the economies of material handling in a minus 10 F environment. Primarily a distribution operation, with its small lots and relatively rapid turn-over, the conclusion pointed to a single-story operation.

As a compromise between small lots on one hand and a high ceiling on the other, the final plans included a 2-ft high mezzanine deck with a floor loading capacity of 250 lbs. per square foot, located in the center one-third of the refrigerated area. This provides a total floor area of approximately 130,000 sq. ft in the warehouse, and allows stacking heights of 14 to 20 feet in two-thirds of the building, and 10 to 12 feet high under and on top of the mezzanine. This 12 foot height makes it possible to serve the mezzanine with high lift fork trucks from the main floor and electric equipment on the deck.

Keeping in mind maximum customer service with minimum operating cost, building design included an enclosed truck service dock 26 x 380 ft along the south side, and an enclosed railroad dock 20 x 300 ft on the east side. The truck dock has 15 openings 20-ft wide equipped with spring-loaded overhead sliding doors, and has eight hydraulically-operated truck levelling ramps to match truck tailgates to platform level. Sliding refrigerator doors (see Fig. 1) open into a vestibule area having two pairs of auto-close doors which are set at an angle in order to open easier. Openings are arranged for one-way traffic.

Construction Procedures

Construction started by installing pipe on top of soil (as shown in Fig. 2), to provide some control against ground freezing. Ends of nine four-row circuits were later brought up on the dock and sealed off. If any section of the floor should later require heat, then warm oil can be circulated in that area to minimize the freezing possibilities. Since the finished floor level was to be four feet above the piping a compact clean dirt fill was made.

Simultaneously with the piping and fill work a pile driver began setting the 245 piles used to support the building. Each 12-in OD hollow steel pipe was driven to a depth varying from 15 to 20 ft below grade, then completed by placing reinforcing steel within and filling with concrete. This was followed by pouring of a reinforced concrete grade beam between the outer row of piles upon which the structure was supported.

Reinforced piles were decided upon primarily because of the many foundations and railroad roadbeds scattered around just under the surface of the ground. Had evacuated footings been used, these would have had to be removed wherever they interfered. Another reason was based upon the varying condition of the soil structure which complicates depth and size of the footings for the foundation. A third reason stemmed from earthquake construction requirements —two T-shaped column assemblies or towers erected in the central part of the building. Immense footings would have been required for these. Also, two weeks of construction time was saved with driven pilings. As fast as they were placed, the grade beam (similar to a continuous foundation footing) was poured and the reinforced brick sidewalls started up.

Perimeter Insulation

At this stage sidewall insulation work was started. Expanded polystyrene was used below the floor level. Thickness was determined by calculations based on the estimated locations (see Fig. 3). This insulation was applied directly to the walls and dirt fill directly against it. As the brick walls continued upward, the fill was properly compacted throughout.

Floor Insulation Omitted

No additional insulation was placed between the dirt fill and the concrete slab. Conductivity coefficient for dry and packed earth is about .035 Btu/ft/hr/sq.ft/degree F. The four foot fill used is therefore equivalent to substantial insulation and was considered acceptable. Just prior to the pouring of the 5-in concrete slab, a number of thermocouples were located at depths ranging from three to 15 feet below floor level for checking temperatures under the building in order to anticipate ground freezing problems.

Floor-laying operation was completed in 9 working days, and averaged about 12,000 sq. ft. per day. It was done in alternate sections so that portions could be done each day.

Meanwhile, the reinforced brick wall was approaching its finished height of 16 feet above the floor and 20 feet above the ground. Because of this relatively low height it was possible to make it entirely free-standing. Steel columns were then located approximately 12 inches inside the brick wall all around and with no connections of any kind to the wall at any point. (Fig. 4 shows steel work underway). This method was used in order to permit the best possible installation of probably the most important detail of the entire construction—the vapor barrier.

This building was planned in such a way that the laminated and reinforced paper-and-aluminum foil vapor barrier could be applied to the walls from the foundation up and over the top, joining and sealed to the composition roof, thus keeping a vapor-proof envelope around the entire building. The roof itself is a built-up composition type covered with pea gravel and coated with a white cement-base topping so as to minimize the effect of the solar heat load. Another reason for free standing construction was to permit shrinkage of the steel members when the temperature is dropped to minus 10 F.

Erection of the 70-ft trusses was followed by 2 x 12 rafters elevated with fork trucks and placed on the top side, ready for locating and securing. At this time mobile wood scaffolds were built up across the width of the building, each one just wide enough to pass within the columns (see Fig. 5). First used to set the rafters, they were then used by the sub-contractor to install 56-in thick exterior grade plywood to the underside of the rafters. Each of these panels had been pre-drilled with a number of 3/4-in holes, to allow entrapped moisture or vapor to migrate into the room. Simultaneously with the roof work, the carpenter crew was erecting 2 x 6-in. studs along the sidewalls, leaving a clearance of about 2½-in. from the vapor barrier.

Unique Roof Construction

Forty-five carloads of insulation were delivered to the jobsite, in thicknesses of 6-in. and 2½-in. It was placed between the roof rafters (from the top side—see Fig. 6) and the sidewall studs (from the inside) making 12-in. and 8-in. insulated boundaries respectively.

A feature which helped the ceiling insulation application considerably, was the unique plywood roof structure which eliminated the solid blocking from between the roof rafters. Exterior grade plywood was used for the roof diaphragm and a piece of this same 5/8-in. material 3-in. wide and long enough to fit between the rafters is screwed onto each panel.

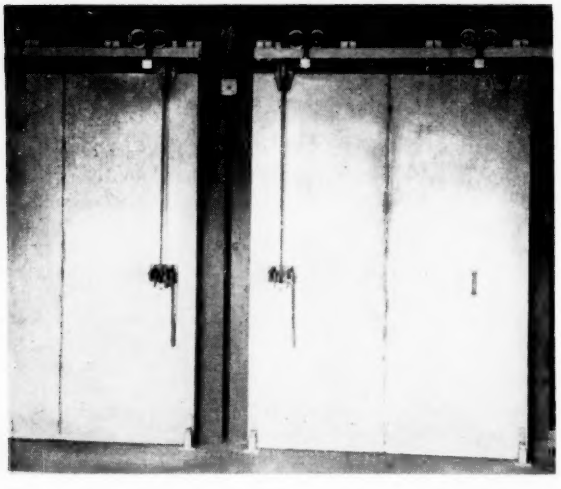


Fig. 1—Horizontal sliding doors arranged in pairs provide access to the huge single room freezer storage from a number of locations on both docks.

Fig. 5—Photographer is caught in the act. While the chief snaps the high lift placing roof rafters on the working scaffold, an assistant shoots a broader view of operations from over his shoulder.

Fig. 6—Two 6½-inch layers of semi-rigid insulation is placed between roof rafters over pre-drilled plywood panels; roof diaphragm, weather barriers next.

Since the same procedure was used over the entire roof, plus nailing the panels to the rafters, a practically continuous sheet of plywood was achieved. Screws were driven by an electric screwdriver without any pilot holes, about the same speed as driving nails.

Interior sidewalls on the other hand, were covered—after insulating—with 1- x 6-in. Douglas Fir, surfaced four sides, and then sprayed with a white latex-water base paint. The 1- x 6-in. material was specified because it forms a very durable surfacing, easily repaired if damaged, economical in cost, and quick to apply and paint. Vapor escapement slots are formed when the lumber is placed on the studs. Not too visible, they are nevertheless effective. The same type of white paint was applied to the ceiling.

Pipe Coil Refrigeration With Liquid Recirculation

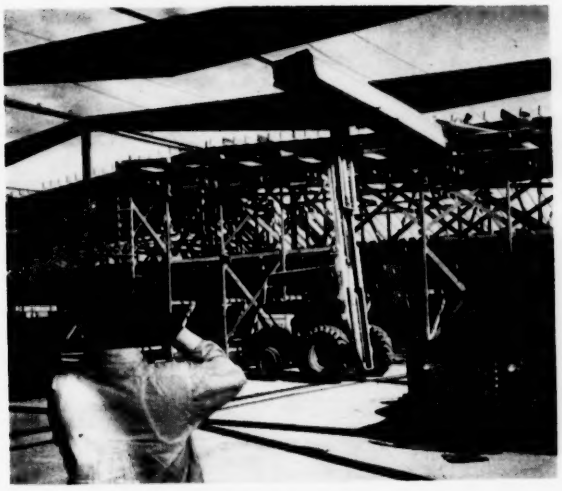
Much thought had been given to the refrigeration. Only 450 feet away from an existing compressor room, it was decided to run a pipeline underground and use present facilities.

Being a distribution warehouse where all the product is frozen before being stored the load is relatively light. No high velocity air movement is required as there is nothing to freeze. This same low movement would result in less stored product dehydration, higher quality, and longer storage periods. To obtain these conditions, it was decided to use overhead pipe coils over the entire ceiling. Past experience has definitely proven this method insures uniform temperatures throughout, and at the same time secure maximum cooling by direct radiation. To obtain improved heat transfer, a liquid recirculating system was planned.

Fig. 2—Floor heaving insurance represented by oil piping grid.

Fig. 3—Perimeter insulation rises from foundation to floor.

Fig. 4—Free standing structural steel permitted continuous vapor seal.



Based on previous experience with such systems, it was decided to install 83,000 lineal feet of 1¼-in. standard black pipe over the entire building, approximately equally divided into 28 individual circuits. Piping in each circuit was horizontal, except for the feed line and the return, and no trap equivalents were permitted within the eight row serpentines. However, each circuit was on a successively higher level as it approached the center of the structure.

During the period of erection, a highmast fork truck was used to elevate the correct number of pipes for each circuit to the desired height. A horizontal hanger pipe was placed below and fastened onto some hanger bars previously located. This supported the sections at the desired elevation throughout the building. The large scaffolds originally used for the installation of the rafters and ceiling plywood, which had been gradually moved 380 feet from one end of the room to the other, were now moved the opposite direction as a working surface for the welding crew. When the welding operation was finished, these scaffolds were dismantled.

Won't Defrost For Two Years

The refrigeration system originates in a small control room located near one corner of the building (pictured in Fig. 7) which contains an ammonia liquid pump and a standby pump discharging refrigerant into a header with 28 metering valves. Discharge header is also fitted with a hot gas header and a testing connection above each of the metering valves. The testing connection can be used for a gauge and also for checking the pressure differential across the metering valve. The hot gas connection is of course for defrosting.

Experience with similar installations has shown a need for defrosting a building of this type only once every two to three years.

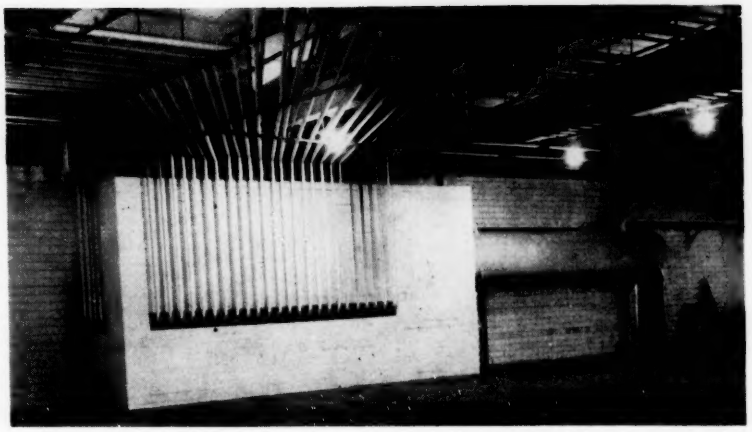


Fig. 7—Liquid ammonia recirculating pump and distributor room, accessible only from outside the new warehouse building.

Liquid level is maintained in the accumulator with a float switch and a solenoid pilot-actuated stop valve. Visually, the level can be observed through several plastic covered glass inspection ports. The control room itself, while being in the large building, is completely insulated and vapor sealed, and is isolated from the refrigerated area. It is kept at normal temperature and pressure ventilated to help keep it dryer, warmer, and free of any odors. The only entrance is from the outside of the building. All valves and screwed fittings are concentrated in this control room, with none in the main room.

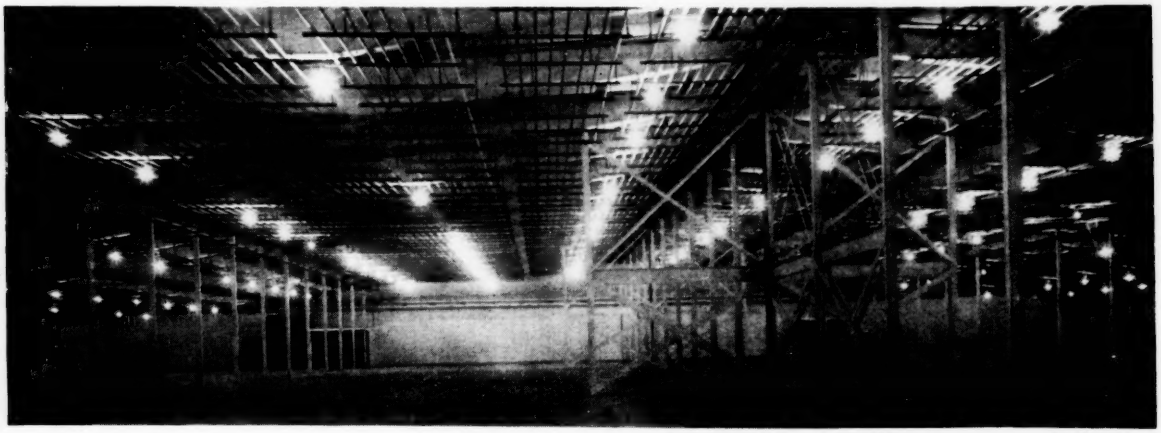
Dry-Pipe Sprinkler System

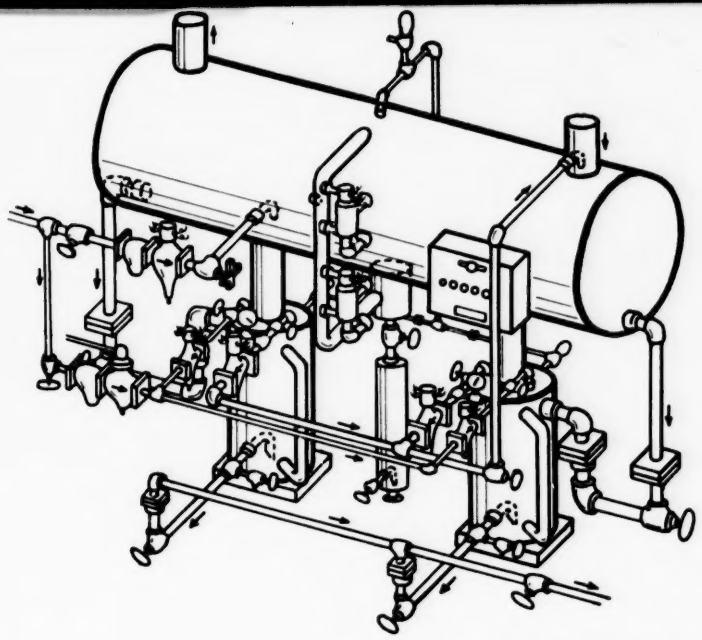
In addition to the piping of the refrigerating system, the room also contains a complete sprinkler system. While the savings on insurance rates on both the building and the stored product make it very worthwhile, it was also compulsory because the building was greatly over-area for the fire zone in which it is constructed. A permit would not have been issued without sprinkler inclusion.

Four separate systems are used, one originating in each corner. These four are all the dry type, in which air pressure is maintained in the piping to keep the water valves closed. A sprinkler head releasing the air will allow the water to rush into the refrigerated area and do its work. Since this is a situation to avoid, all precautions are taken to insure that anything short of an actual fire will not occur. Dock fire protection is achieved with conventional wet pipe system.

Now completed, the building has been officially in use since March 17, the opening date. The temperature was lowered to the desired level over a three week period and has now been steady. Actual operating experience is now accumulating, appears to bear out that the design is basically satisfactory. Work yet being done can be classified as refinements or additions which developed from actual use of the building and will continue to be made as operating conditions show them to be profitable.

Author Regis Gubser is Vice-President—Engineering, California Consumers Corp. Co-author George Paulick is his Ass't.





Applications of Improved Auxiliaries Achieve Economical Frost Removal

By J. E. Watkins

AUTOMATIC DEFROST SYSTEMS

››› PRODUCING consistent subfreezing temperatures requires strict attention to the frequent removal of frost as it accumulates on the cooling surfaces. Otherwise, power costs increase while cooling capacities decrease until eventually a point is reached where desired temperatures can no longer be maintained.

Frequency of defrost will depend on several factors: temperature of the air over the product being frozen or in storage; the temperature cooling range of the air in the freezer space (that is, the difference in temperature of the air entering and leaving the cooling surface); the quantity and relative humidity of air leakage due to door opening and infiltration; air velocity over the product; and the moisture proof packaging.

Effect of air temperature and cooling range on moisture pickup is illustrated in Fig. 1. Since air weight remains substantially constant at all temperatures, as does the air's specific heat, moisture pickup (with constant air range) is practically directly affected by temperature alone. Thus, with air warming up 10 degrees, say from 10 to 20 F, one pound of air can pick up at least twice as much moisture as the same air warming up from minus 10 to 0 F, *if the moisture is made available*. Similarly, an air range between minus 50 and minus 40 F will result in practically no moisture pickup, regardless of packaging, leakage or infiltration or any other factor. Air's capacity for moisture is very nearly the same at the two points.

The relationship is shown in more practical manner in Fig. 2. Dating back to a test performed in 1942 on one of the first large blast freezer installations, the figure explains why it is more economical to freeze shrinkable products at as low a temperature as possible. Not only does it pay in dollars and cents, if the moisture lost from the product represents loss in sales weight, but less frequent defrosting is required.

For a listing of types of automatic defrosting systems see Table I. The fact that all five methods of automatic defrosting are extensively used, demonstrates that each has its merits and specific use. In turn, each has its drawbacks.

TABLE I — PATENTED METHODS OF AUTOMATIC DEFROSTING AVAILABLE*

›› 1. Prevention of frost accumulation by spraying the cooling surfaces with a brine or anti-freeze solution which is held to a constant strength by the continuous addition of heat to boil off the accumulated moisture.

›› 2. The periodic application of heat electrically to warm up the cooling surfaces and melt the frost accumulation.

›› 3. The controlled circulation of warm air from outside the freezer space and across the cooling surface.

›› 4. The flooding of water over the cooling surface at intervals dictated by the rate of frost accumulation.

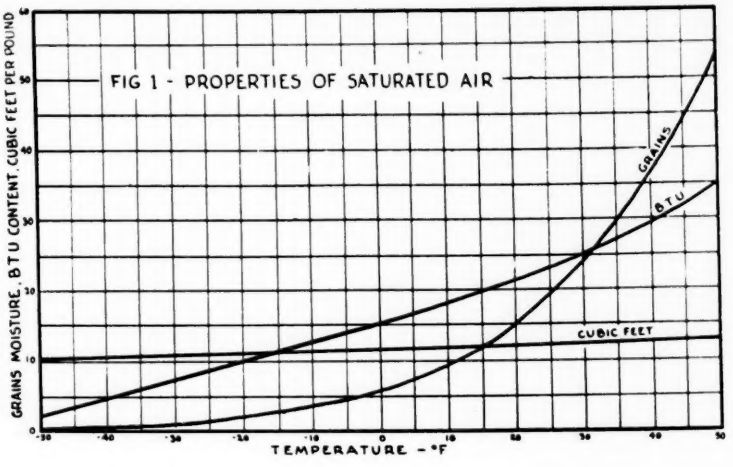
›› 5. The use of hot refrigerant gas from within the refrigerating cycle itself.

*Scraping of pipe coils or other cooling surfaces is omitted since this discussion is confined to automatic defrost systems. Use of long pipe coils, bare pipe or finned, and plate surfaces in freezers is widespread. Problems involved in collecting and carrying off the water resulting, call for manual treatment.

Continuous Defrosting

One apparent feature favoring the first mentioned type of system, is the elimination of temperature fluctuation in the refrigerated space which might be directly attributed to periodic shutdowns for defrosting. Such fluctuations can be shown to cause an increase in moisture pickup by the circulated air, over a steadily maintained temperature and humidity con-

Condenastion of talk presented by J. E. Watkins at a joint meeting of ASRE-NAPRE, Pittsburgh, Pennsylvania, January 13, 1958. Subsequently the same talk was given by Watkins or his associate, R. B. Bass, at NAPRE Chapters in New Orleans, Kansas City, New York City, Detroit, Memphis and Green Bay. First installment in this issue; watch June issue for conclusion.



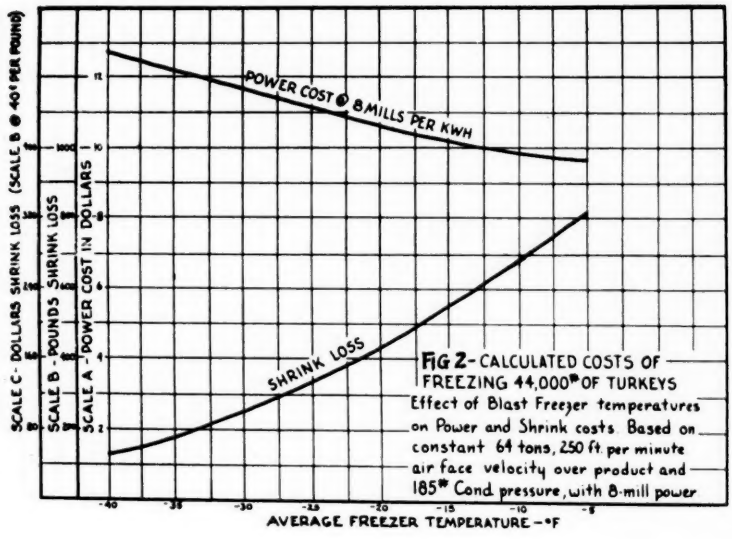

SCALE C - DOLLARS SHRINK LOSS (SCALE B @ 40¢ PER POUND)
SCALE B - POUNDS SHRINK LOSS
SCALE A - POWER COST IN DOLLARS
POWER COST @ 8 MILLS PER KWH
SHRINK LOSS
AVERAGE FREEZER TEMPERATURE - °F

FIG 2 - CALCULATED COSTS OF FREEZING 44,000# OF TURKEYS
Effect of Blast Freezer temperatures on Power and Shrink costs. Based on constant 64 tons, 250 ft. per minute air face velocity over product and 185# Cond. pressure, with 8-mill power

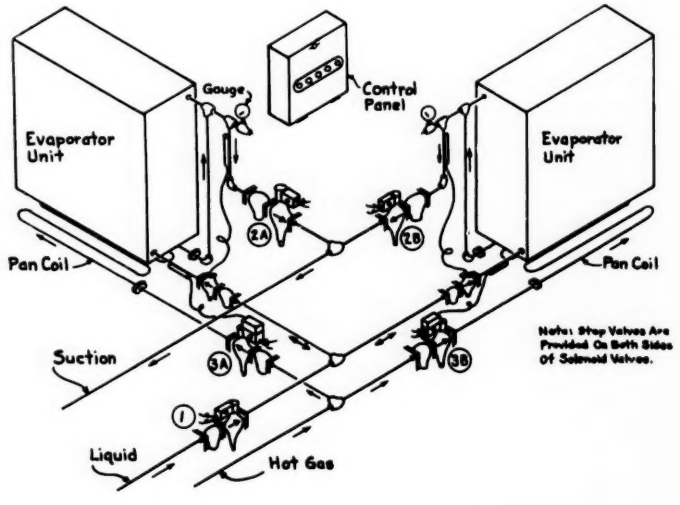


Fig. 3—Dual Evaporator Hot Gas Defrosting System In Which Liquid Condensed During Defrost of One Unit is Evaporated By Useful Work in Companion Set.

dition. What value this feature had in the early days has been offset somewhat by the improvements in product packaging which help frozen product to retain its moisture content.

From the standpoint of equipment design, the continuous spray system seems to offer another advantage, in the considerably higher heat transfers available because of the wetted surface. Obviously this reduces the cost of the cooling surface and nothing else, all things being equal. This saving is more than offset by the cost of the concentrator, pumps and allied equipment. Freezeup can result with weakening of the solution, or stiffening of the solution due to over-concentration. Costs of pumping, continuous reconcentration and cooling must be considered.

Defrosting Electrically

Electrically heated units are designed to cause defrosting either by direct contact of the electric heaters on the coils or by trapping the heat in the coil enclosure. Such units obviously cannot be of large capacity if they are to be competitive with other types both in first cost and operation. Source of heat is external to the refrigerating cycle, calling for one Kwh of energy for a delivery of 3410 Btu/hr. The electrically heated unit has the advantage of relative simplicity in single unit installations.

Defrosting With Air

This type of system—widely used in relatively large installations—does not lend itself to automatic operation except in very small sizes. The automatic dampering, damper freezeup in the event of air leakage, and other such considerations in automatic application, limit the proper use of this system to large, supervised plants in which defrosting is manual.

Water Defrosting

This method has been very popular, particularly where the defrosting could be accomplished manually. However, automatic water defrosting has not been very reliable where available water falls in temperature to near freezing. Using 50 F water to deliver the 3410 Btu/hr required for defrosting will require 23 gallons. In Chicago this will cost 2.1c. Water, then, where not at an absolute premium, is not particularly expensive.

First costs of water defrosted units compare very favorably with those of other types, since only water spray headers or distributors and large drain connections in the unit pans are required. Mainly, the disadvantages arise from the automatic controls.

Hot Gas Defrosting

Defrosting with hot gas can be accomplished in several ways. Because the direct application of hot gas to a cold coil adds a considerable volume of refrigerant condensate to a coil perhaps already nearly full of liquid, all such systems provide for moving the liquid from the coil to a part of the system where it will do no harm. Certainly it cannot be drawn back directly to the compressor. And, some provision must be made that the coil will be supplied with hot gas during the entire defrosting.

On small installations, one well-known method employs a heat storage unit in addition to the cooling coil or evaporator, which heat storage unit provides a load for the compressor to pull on while supplying hot gas to the evaporator. Still another system uses heat from electric heaters to boil off the liquid pushed out of the evaporator, accomplishing the dual function of guaranteeing a source of hot gas and of boiling off potential liquid slugs.

Still More Methods

A third method includes a small suction accumulator containing a liquid coil, designed to collect the liquid during defrosting and evaporate it later during normal operation. Fourth arrangement places a reevaporating unit outside the freezer, to accomplish the same purpose as the heat storage unit or electric gas generator on single evaporators.

There are other hot gas systems available—all of them workable and acceptable. All systems will use either hot gas coils in or under the drain pan, or electric heating grids or blankets in the pan. And drain lines will be heated either by electric cable or by running the hot gas line in contact with or inside the drain.

New Hot Gas Developments

Additional practical and economical approaches to the various aspects of the problem, by means of hot gas, have been developed recently. The problem of defrosting surfaces is not greatly altered by the type of refrigerant used. Metals employed will vary with the refrigerants used, as will operating pressures; but methods will remain the same. The choice of refrigerant is dictated by the application and size for which the plant is designed. Generally speaking, the industry appears to have settled the halocarbons up to five hp, and ammonia in larger sizes. However, fluorinated halogen refrigerant equipment is available and is used in larger sizes as well. Where plant requirements include a multiple room setup, or multiple compressors, design considerations heretofore have argued in favor of ammonia. However, still another approach to overall plant design makes halocarbons available to this multiple compressor, multiple evaporator field.

Small Plant Systems

Few favor installations of equipment where its operation is limited to one function, which is discharged in a matter of minutes, a few times a day. Such equipment is the heat storage tank, gas generator or reevaporator whose only function is to supply heat to keep a compressor running in order to add more heat to a hot gas supply for the defrosting.

Recommended instead is the installation of (usually) two evaporators with means for alternate defrosting of these evaporators; one evaporator serving as load to keep the compressor running while the other evaporator is defrosting (see Fig. 3.) In this manner, the hot gas for defrosting is obtained from direct action of the compressor on the "pay load", and first cost is held down by the elimination of auxiliaries. Heat for defrosting is obtained at practically no cost since its source is in the refrigerating cycle itself. Such cost as can be charged to defrosting in this way is due in some plants to the operation of the compressor during defrosting, at lower than normal suction pressure. In some cases there may be a gain in efficiency due to the use of the cold coil as a condenser.

The control panel furnished with this combination is wired so that when a particular time clock trips to defrost its evaporator, the evaporator's fan is shut off, its drain is heated, its suction outlet is closed and hot gas is led into it. Liquid, on the other hand, is led out through the thermal valve to the second evaporator, the main liquid being closed. When the defrosting is complete and the bulb of the bypass thermostat warms up, the hot gas valve is closed and the evaporator remains inactive until the time clock completes its defrost period. The liquid solenoid, however, is opened during this rest period so that the compressor continues to operate on the other evaporator.

The same arrangement can be used in large plants, each two evaporators or two groups of evaporators forming its own defrost system apart from the balance of the plant. The compressor must be kept operating during defrosting, however, if complete defrosting is to be guaranteed during the period set by the clock.

While Fig. 3 shows thermal valve feed, it should be evident that evaporators equipped with float valves and surge drums can be defrosted in the same dual manner. By placing a check valve (Fig. 4) in the liquid leg and the suction solenoid in the coil outlet to the surge drum, the liquid is pushed from the defrosting unit to the other unit. Danger of filling the surge drum and slugging the compressor is thus eliminated.

(To Be Continued—See June IR)

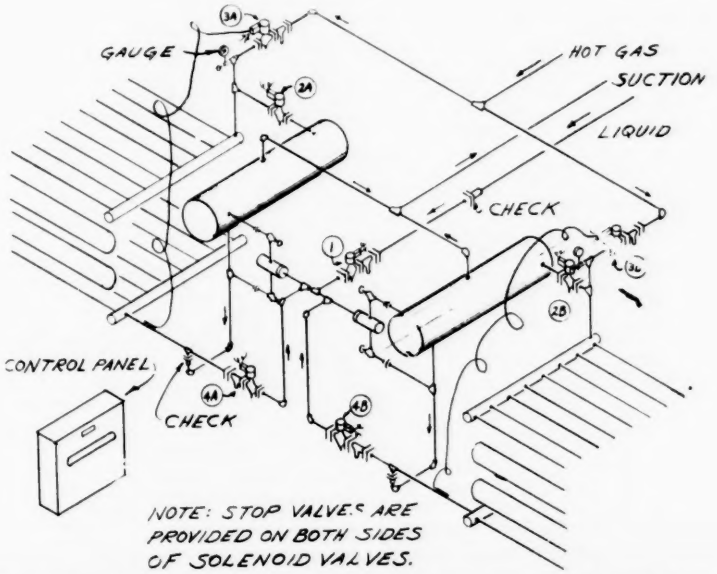
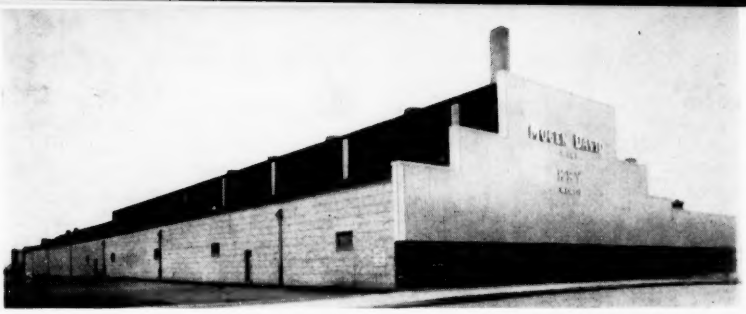


Fig. 4—Dual Evaporator Hot Gas Defrosting System Where Full Flooded Units are Used as Contrasted to the Thermally-Controlled Units in Fig. 3. Hot Gas Forces Liquid From One Unit to Partner Unit Reducing Slopover Danger.

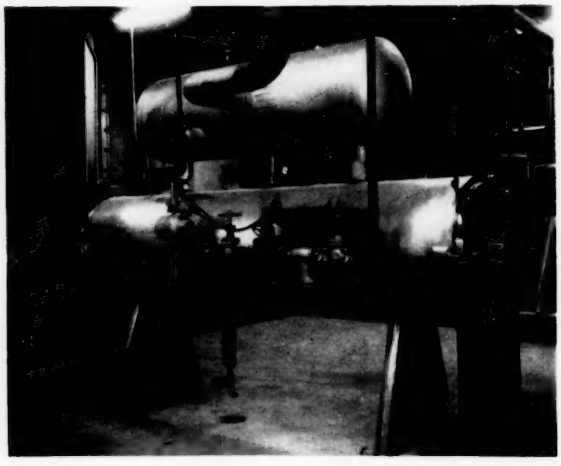


MOGEN DAVID CORP. LARGEST OUTSIDE

KEY wines, new blends by Mogen David created especially for American tastes are produced in this $3½ million dollar winery opened at Chicago, 1957.

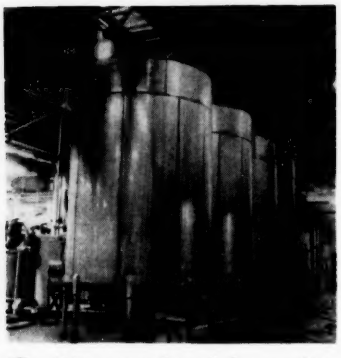
1. KEY wine processing begins in this area with fluids from stainless storages.

2. Laboratory is important part of quality beverage production. Samples are tested continuously.

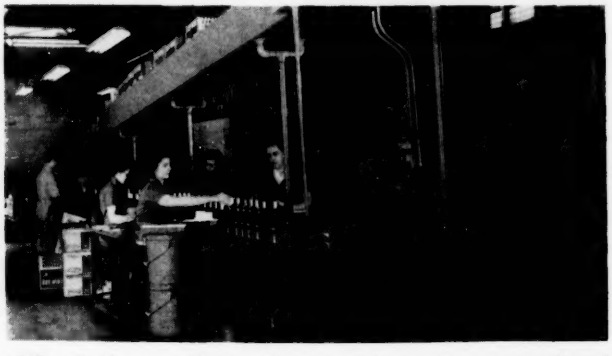


5. Wineries require refrigeration for fermentation control, for tartrate and coaguables removable, for color control. This Mojonnier external chiller is rated at 150 TR.

6. Twin-cylinder NH_3 compressors operating the chillers while 15-TR machine (background) holds tank room, by Midwest Eng'r'g & Equip't Co.



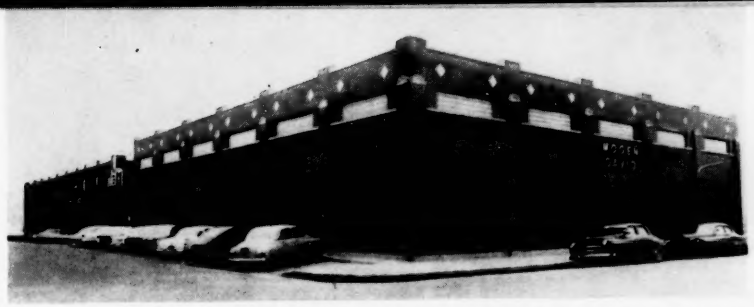
9. Wine transferred from refrigerated room awaits bottling.



10. Bottles are filled with one of four wines, capped and sealed continuously. More machinery cases product.

EXCLUSIVELY

THIRD NEW WINERY CALIFORNIA STATE

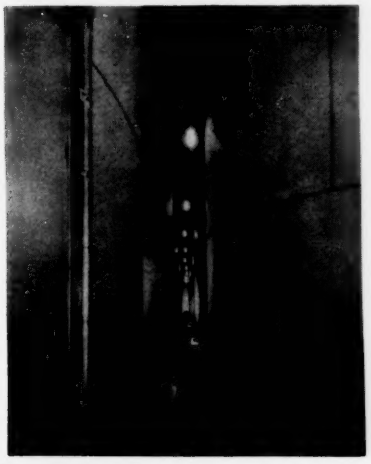


Concord Grape Winery and Executive Offices, Mogen David Corp., Chicago. Among world's largest wineries, the KEY winery triples their wine making.

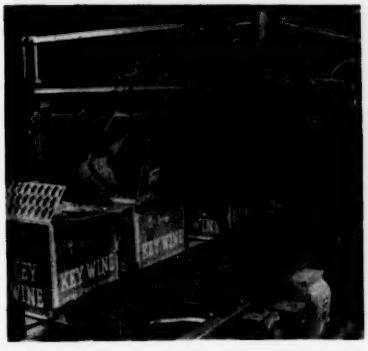
3. Agitator facilitates smooth blending of wine sugar and grape juices to start batch.

4. Huge redwood tanks, 30 in number, receive various batches for fermentation.

7. Erected by Industrial Cork Products, refrigerated storage (with Jamison doors) contains 11 fermentation control tanks.



8. Looking between rows of 14 ft. x 20 ft. (60,000 gal) tanks in refrigerated room. Wine is chilled before storage.



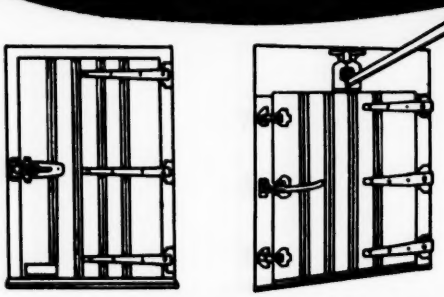
11. Cases are closed and sealed automatically as pictured.

12. Cases of finished product are placed on pallets and stored in well-lighted warehouse.

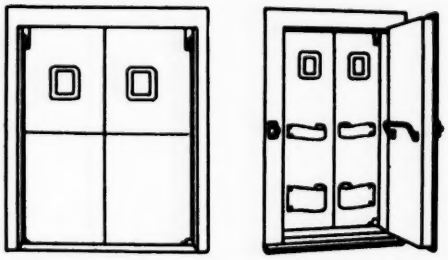
"Butcher Boy"

Since 1885

EXCLUSIVELY ENGINEERED

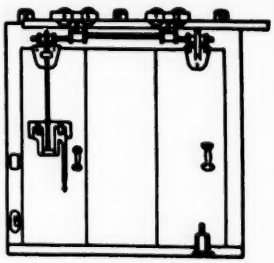


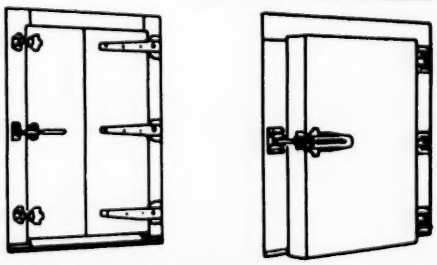
STANDARD COOLER-FREEZER DOORS



STANDARD VESTIBULE AND AUTO-CLOSE DOORS

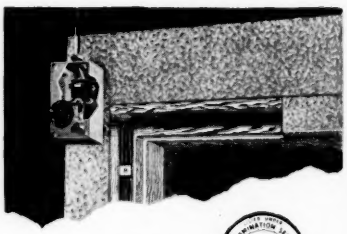
HORIZONTAL SLIDING DOORS (Manual)





LOW TEMPERATURE INFITTING and OVERLAP

AUTOMATIC ELECTRIC DEFROSTERS
WITH THERMOSTAT CONTROL



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FLEXIBLE RUBBER BATTEN DOORS

INCLUDING STANDARD DOOR FRAME

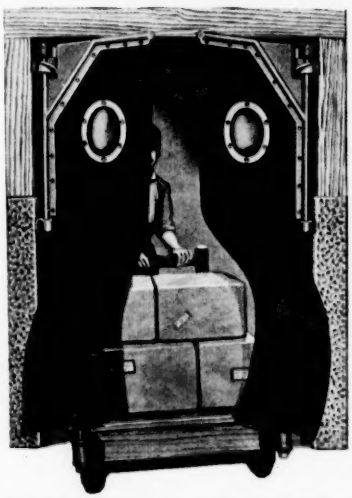
at no extra cost!

TYPE "TSH"
WITH SEMI-HEIGHT MOUNTINGS

Especially adaptable for smaller door openings.

THEY PERMIT

1. Safe passage of hand or power operated equipment with wider pallet loads.
2. Corner cutting with hand and power trucks.
3. Repeated abuse from impact of trucks at minimum damage and maintenance costs.



Model TSH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures.

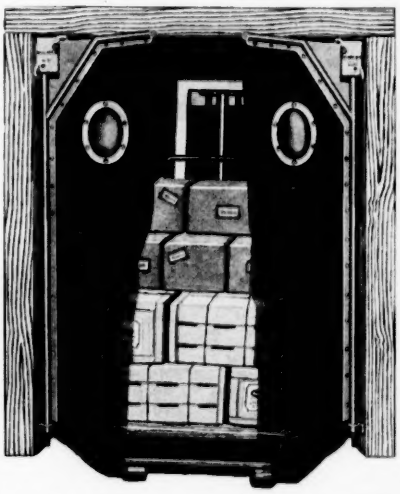
Model TSH battens are furnished with No. 12 gauge galvanized steel jamb guards applied 4' 0" high with *no protrusions into the clear door opening.*

TYPE "FH"
WITH FULL HEIGHT MOUNTINGS

Designed for wider and "straight traffic" doorways.

ADVANTAGES

1. Loss of refrigeration is held to a minimum.
2. Extra rigidity — tighter doorways.
3. Eliminates exposure and drafts near loading docks or at other openings.
4. Flexibility of battens permits repeated abuse and shock of mobile equipment contacts.
5. Permits movement of trucks and pallets at high speed in and out of refrigerated or other storage areas.



Model FH battens are made of ¼" thick Neoprene (no grain) or of ¼" tough specially compounded rubber, reinforced with 2 layers of heavy cotton duck. Materials remain flexible even at extremely low temperatures, and will not tear under most severe conditions.

BUTCHER BOY REFRIGERATO

1000 BUTCHER BOY DRIVE

REFRIGERATOR DOORS

Electro SAFETY-SLIDE HORIZONTAL DOORS

FEATURING **STRUCTURAL SIMPLICITY**

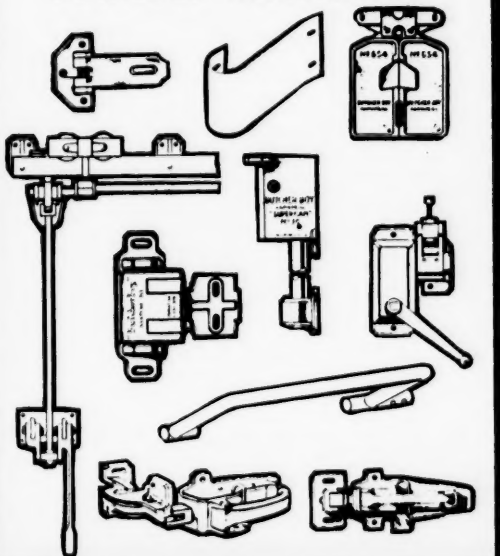
- **MECHANICALLY SOUND**
- **COMBINED "SPEED AND SAFETY"**
- **EXCLUSIVE AUTOMATIC SEALING "Gasket Assembly"**
- **SIMPLIFIED INSTALLATION**

Bi-Parting Horizontal Sliding Doors Available. CAUTION: Not recommended for use in cooler or freezer areas. Bi-Parting double horizontal sliding doors, of necessity, require gasket seals where the doors meet at the center of the opening. Hence, gaskets must be applied at "vulnerable" areas, exposed to contact by trucks or other objects which will rip or tear the gaskets, thereby destroying the necessary seal between the doors. *Field experience dictates this precaution against the use of bi-parting sliding doors.*

14 OUTSTANDING FEATURES

1 Overhead chain drive.
2 COMPACT — Electric Power Operator Assembly.
3 Heavy malleable iron Hanger Brackets.
4 Hyatt roller bearing Door Bracket.
5 Manual "Safety Release".
6 Automatic Sealing Assembly.
7 Automatic Electric Defrosters.
8 Concealed electric systems.
9 Safety Edge.
10 Complete Frame metal clad.
11 Special "SEAL" and "SILL" gaskets.
12 Defroster Drain Outlet.
13 Manual "Interior Safety Release".
14 "Roller-Type" Floor Wedges.

DURABLE HARDWARE



DOOR CO., Dept. "IR"
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Practical Refrigeration Engineer

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All refrigerating engineers are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

From the President's Desk

Chapter Reports—Public Relations Tool

»» OF COURSE employers read our chapter reports! That's the answer our national office recently gave an inquiry received from one of the chapter scribes. Most recent proof of that fact appeared in the *Transportation and Storage News Letter*, Vol. 15. Two pages in this recent issue were given over to "Industrial Self-Destruction", the topic at a Los Angeles Chapter Meeting last year. NAPRE is happy that one of their programs was of sufficient interest to merit such a citation.

Purpose of the chapter report is manyfold. Good reports being informative and educational data not only to members-at-large and other chapters, but, as proven above, many non-members, especially management, look over those reports. Therefore, they are a chapter public relations tool. Knowing this, the NAPRE directors for the past two years have offered inducement in the way of U.S. Savings Bonds, for the best reports. It is hoped that the reports will improve, more chapters will participate and the industry be better served.

Denver Chapter, NAPRE, and their chapter reporter Frank DiDonato receive honorable mention for this month's report, which carried a description of the practical instruction given at a recent meeting which featured electrical maintenance. Attached to his report was the speaker's manuscript. Unfortunately some of the glory escaped them as the topic had been previously covered by another speaker at a West Coast Chapter, and the manuscript condensed and reported on at an earlier date.

Spring Conferences Rolling

Regional conferences have captivated the attention of many chapters and members-at-large. It appears that more regional gatherings will be held this year than in any other previous year of NAPRE history. First official regional conference of the year was the South-Central meeting held March 7, 8 and 9 at Jackson, Miss., where a newer chapter was host and demonstrated its potential leadership with an excellent program under the guidance of President Jim Thompson, assistant engineer, Swift & Co.

Following the suggestion of our national office, Southeastern Pennsylvania chapter scheduled an impromptu conference in connection with its recent chartering. On March 29, national past president Erich B. Utescher presented a charter to the Pennsylvania Dutchmen assembled in the New Brunswick Hotel at Lancaster. Effort of the chapter president, S. Milton Rambo, national director, NAPRE, in arranging a very informative tour of Consumer Packing Co. for all out of state visitors was much appreciated. This combined with the charter presentation made the Lancaster trip well worth the time and expense.

Frank L. Chase

New Michigan Chapter Host For North-Central Meet

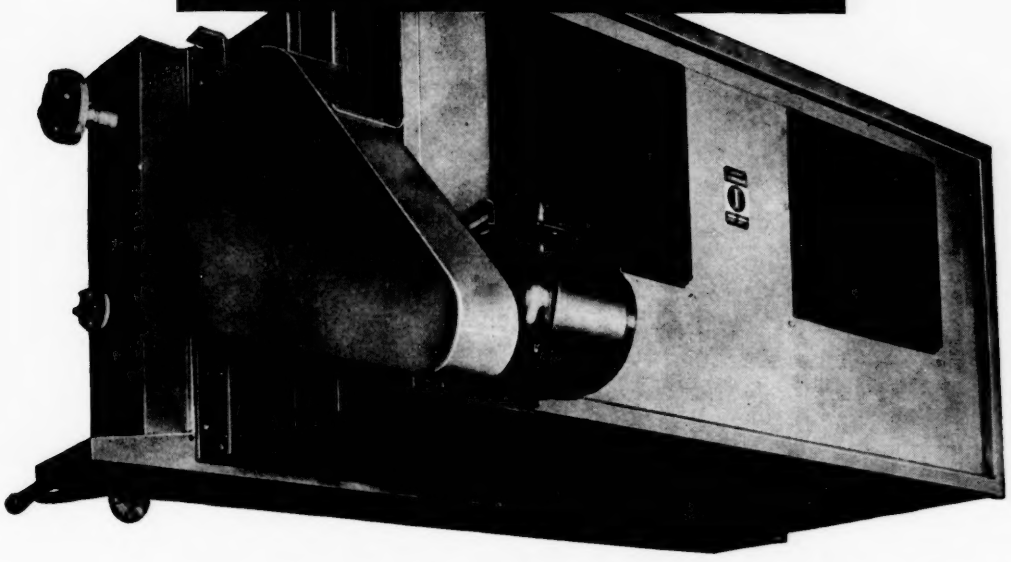
On April 26, the Fruit Belt Chapter expanded on the Lancaster idea and staged a full fledged conference in connection with the chartering of that new chapter at Benton Harbor, Michigan. A professor of refrigeration, a refrigeration service engineer, and a refrigeration contractor were the three principal speakers. Three field trips were made to local plants utilizing the refrigerating methods, service and maintenance program, and design, respectively, covered by the speakers. It is reported as being an ideal program and the new members under the leadership of Tom Dewhirst are to be congratulated.

Washington Chapter No. 1 at Seattle has scheduled a regional conference for the first week in June. At the other end of the Pacific Coast, it is understood that Bakersfield will be host to a regional conference soon. Bakersfield received its charter earlier in the year. At that time, it could almost be said that the affair was a state-wide gathering. Past national officers and chapter members from as far away as San Francisco and Sacramento, and from Los Angeles and Colton, were on hand to get the new chapter off to a rolling start.

Frank L. Chase

Extra-Large
CAPACITY

THERMOBANK



for FREON and AMMONIA

NOW...no job is too large for the KRAMER THERMOBANK

The only completely automatic system for freezing temperatures offering these extra large capacities. THERMOBANK requires no manual attention whatsoever.

Ceiling mounted, THERMOBANK takes no precious floor space. You can store products directly under the unit.

Can be used as an independent system or with an existing large system without affecting the operation of other evaporators.

WRITE FOR BULLETIN 294-6

KRAMER TRENTON CO. • Trenton 5, N.J.

NAPRE Question Box

HAVE A QUESTION? Address it to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif. Answers appear monthly in this department on problems forwarded by NAPRE members. Comments from all readers welcomed.

H. P. Hayes

Fluorescent Heat Loads

QUESTION: Last year in a Chicago Chapter meeting we worked out a practical problem on air conditioning where a factory building was illuminated with fluorescent fixtures. The instructor used a Btu figure based on 40 watts per tube. I maintained that two 40 watt tubes and ballast would be the equivalent of 100 watts incandescent lighting. I bowed to the consensus of those in attendance.

Now, however, I see in "Science and Appliance" that a standard 100-watt fluorescent unit contains two 40-watt tubes and ballast, is said to yield more than three times as much light as a 100-watt incandescent bulb. That still leads me to believe that my original contention was right. However I need an authority. Can you point one out?—H.R., Chicago.

ANSWER: In accordance with the law of conservation of energy, the total heat that would enter a room from a fluorescent fixture would be the heat equivalent of the electrical input. That would be the heat from the bulbs, plus the heat from the ballast coils. It would be about 100 watts for two 40-watt bulbs. The ASHAE Guide gives an allowance factor of 1.20 to allow for the power consumed in the ballast:

2 x 40w x 1.2 = 96 watts.—**N.S.**

Discharge Temperature?

QUESTION: What should the discharge temperature be with 25 psi suction pressure and 165 psi discharge and 50 F suction temperature at the NH_3 compressors?—L. H. B.

ANSWER: Assume that pressures given are gauge; corresponding absolute pressures at sea level would be 40.7 psia and 179.7 psia. Saturated vapor at 40.7 psia has a temperature slightly below 12° F so that the suction vapor will be assumed to be superheated to 50° F in the suction line.

For ideal compression (frictionless), follow along the constant entropy line on the pressure-enthalpy diagram* from point 40.7 pisa, 50° F, to 179.7 psia. Temperature will be shown at about 255° F for ideal compression.

In actual practice friction is encountered both in the flow of the gas and in the rubbing of the mechanical parts of the compressor. On the other hand, heat is removed by the water-jacketing of the cylinder and cylinder head. No exact prediction of the discharge temperature can therefore be made. However, usual super-heating of the gas will be about 25 percent greater than that of ideal compression. Therefore, the discharge temperature will probably be about 300F.

—**N.S., San Luis Obispo.**

Where . . . Do We Put Machinery?

QUESTION: Is there any rule of thumb for determining how much space should be provided for in a building so that there is plenty of area for the equipment room? We are planning a new office building and would like to be able to guess in advance what our machinery room (air conditioning) requirements will be.—S.W.B., St. L., Mo.

ANSWER: Design of air conditioning systems is so varied that no approximation can be made of the required equipment room area without considering the type of system. Each building has one suitable.

Most reliable way to insure suitable equipment room size is to call in a consulting engineer for advice during the early architectural stages. Taken into consideration will be such items as access for pulling tubes or nests from condensers and chillers, for removing motor rotors, for lifting machinery casings and rotating elements; room for piping runs without short bends and undesirable traps; space for electrical gear; plus compliance with ventilation, water and sewerage, electric codes, etc.—**N.S.**

*Mollier Diagram; Chart #1, Basic Refrigeration; Chart #2, Refrigeration Theory & Applications.

Discharge Temperature With Clearance Volume

QUESTION: What is the effect on discharge temperature of clearance volume in VSA ammonia compressors?
—E.E., Australia.

ANSWER: It is presumed that a change of clearance volume effected by variation in thickness of the head gasket is being considered. In such a case the small variation of clearance would have slight effect.

Several factors must be considered, such as a designated VSA compressor running at a designated speed, in a designated system. An increase in clearance volume lowers the volumetric efficiency of the compressor which in turn lowers its capacity. A lowering of the capacity lowers the condensing pressure which lowers the discharge pressure.

If the compression could be considered to be frictionless the discharge temperature would also be lowered. However, the compression is not frictionless and the clearance gas must be recompressed. The net result is that there is a slight increase in discharge temperature unless there is excellent water cooling of the head.—**N.S., San Luis Obispo.**

Metering Ammonia

QUESTION: We are contemplating a liquid ammonia meter to measure refrigeration supplied to another business. We are using yearly averages to figure this and we are not sure of gallons of liquid ammonia per ton of refrigeration. Our average temperatures and pressures are: Liquid ammonia 70 F; back pressure 18 psig; condenser pressure 130 psig. Any ideas will be greatly appreciated. A.R.B., Caldwell, Idaho.

ANSWER: Our company has operated an extensive ammonia pipe line system for many years, and a number of our services were metered with an all steel or iron water meter. However consistent and satisfactory results were never attainable if the load was under 35 tons. Meters worked best when the load was on a float valve type of feed so the flow was full and not a mere trickle through the meter. Very small flows seem to leak right through the meter without recording.

We are now using a 1½-in. gasoline meter on a load of 150 to 250 tons, and are getting excellent results and service.

The number of gallons of liquid ammonia per ton refrigeration at your conditions can be determined as follows:

Ammonia per minute per Ton Refrigeration is .406 lbs.

Weight of 1 cu. ft. of liquid ammonia at 70 F is 38.00 lbs.

Lbs NH_3/TR/day =
0.406 x 24 x 60 = 584.64 lbs.

$$\text{Cu. ft } NH_3/TR/day = \frac{584.64}{38.00}$$

= 15.38 cu. ft

Gal NH_3/TR/day = 15.38 x 7.48
= 115.04 gal.

—R. G., Los Angeles

Piping Field Test

QUESTION: How do you field test piping under conditions imposed by Pressure Piping Code, ASA B-31.1, 1951, when relief devices furnished on low pressure vessels are set at 150 psig? Don't want to risk lifting reliefs with subsequent leaks of the refrigerents, etc.—W.V.R. Libertyville

ANSWER: Testing is made before the system is put in operation or charged. The same is true of alterations or components added.

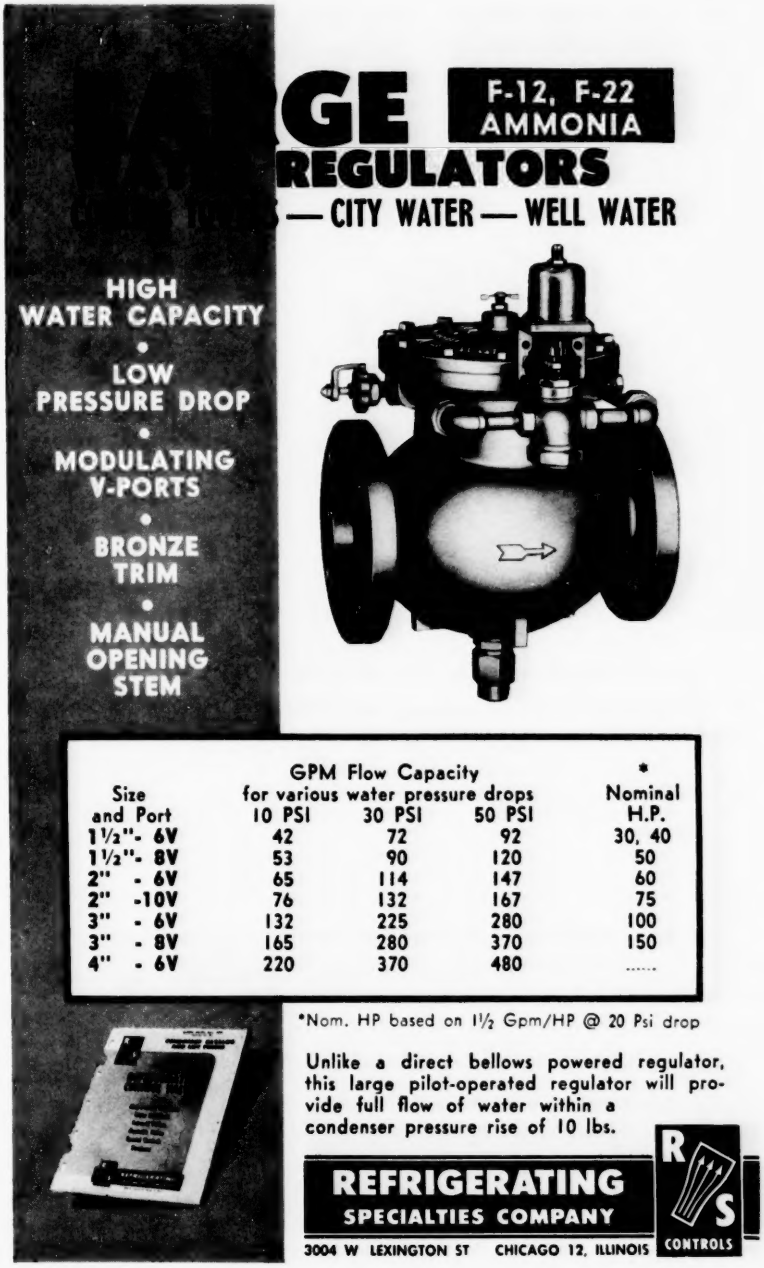
All relief valves should be removed and plugs installed in their place. Likewise, if there are any thermal expansion valves in the system they should be removed since the higher pressure would probably rupture their diaphragms.

The system should be evacuated to within a few millimeters of mercury, absolute pressure. Then sufficient refrigerant should be added to raise the pressure in the system. **Refrigerant drum should then be disconnected** and dry nitrogen should be introduced to the system from its vessel **through a pressure relief valve** set at the test pressure. Leaks may then be detected by the usual manner used for the various refrigerants.

To avoid any danger of rupture to the refrigerant drum or other part of the system, it cannot be too strongly emphasized* that the refrigerant drum should be disconnected before the introduction of nitrogen, and that the system through a pressure reducing valve set at the test pressure.

N.S., San Luis Obispo.

*See Page 30, REFRIGERATION SERVICE AND CONTRACTING, March 1958.


GE
F-12, F-22
AMMONIA
REGULATORS
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HIGH WATER CAPACITY
•
LOW PRESSURE DROP
•
MODULATING V-PORTS
•
BRONZE TRIM
•
MANUAL OPENING STEM
Size and Port
GPM Flow Capacity for various water pressure drops
10 PSI
30 PSI
50 PSI
* Nominal H.P.
1½"- 6V 42 72 92 30, 40
1½"- 8V 53 90 120 50
2" - 6V 65 114 147 60
2" -10V 76 132 167 75
3" - 6V 132 225 280 100
3" - 8V 165 280 370 150
4" - 6V 220 370 480 .....
*Nom. HP based on 1½ Gpm/HP @ 20 Psi drop
Unlike a direct bellows powered regulator, this large pilot-operated regulator will provide full flow of water within a condenser pressure rise of 10 lbs.
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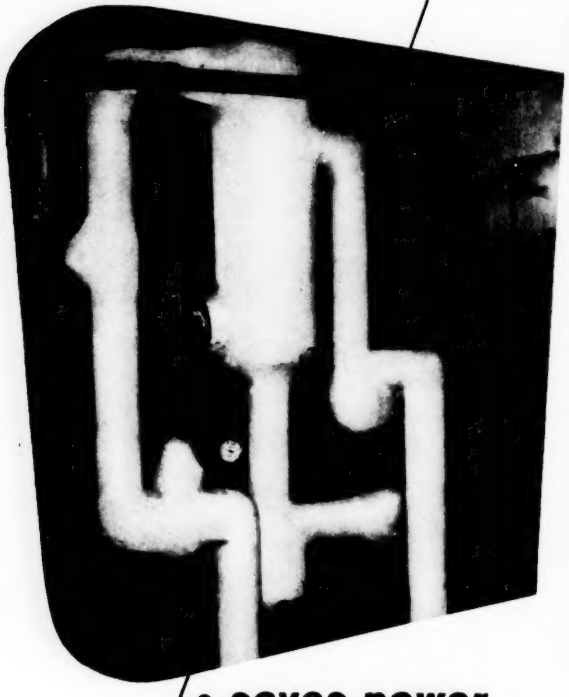

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NEW QUESTIONS

Slug Backs

QUESTION: What causes slug backs in an ammonia plant equipped with recirculating systems? Specifically this occurs when a sudden heat load is put in the cooler or freezer. Apparently more than enough ammonia is circulated to cause the liquid receiver to carry over, or to recycle the system, or in some cases to kick out the entire system when it is needed most.—F.D., Denver.

Corrosion

QUESTION: What can be done to stop corrosion of an aluminum jacketing on our insulated lines? Insulation is Foamglas, but the corrugated jacketing was applied by the contractor using stainless steel bands. At first we believed the corrosion was due to the brine spray coils used in our cooler areas. However, in our freezer storage where we use dry coils the same effect takes place although at a slightly reduced rate. Where the band is applied seems to be the point of most rapid corrosion.—D.C., Dallas.

High Super Heats

QUESTION: Our plant has experienced considerable difficulty with the compressors used on a portion of the plant where we take the direct suction on high temperature rooms located at some distances from the plant. High super heats are encountered with the discharge temperatures running as high as 325 to 350 F. Other compressors in the same plant which take suction from the flash tank run considerably cooler. No valve trouble or scoring is experienced with the latter compressors, while it is quite repetitious with the former.—L.J.V., Birmingham, Ala.

Refrigerant Decomposition

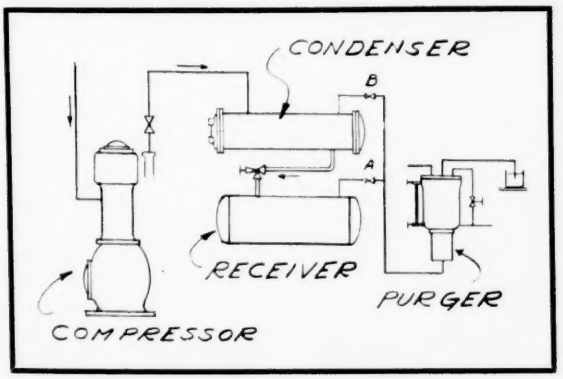
QUESTION: What is the critical point of ammonia? If L.J.V. above is operating at 350 F, is not his ammonia decomposing? Will the average purger remove sufficient quantities of inert gases which result when ammonia decomposes to prevent any disastrous consequences?
—F.R.G., Decatur, Ga.

Brine "Cleaning"

QUESTION: Having always been an operator of direct expansion refrigerating plants of medium tonnage, and being on a new job, I was non-plussed the other day when my plant owner asked if I intended to "clean the brine system and restrengthen the brine for our coming busy season". How does one go about "cleaning" a brine system and where can you find literature on the maintenance of calcium brine?—T.W.J., Dallas

Ice Rink Problem

QUESTION: Our open air ice skating rink located in one of the suburbs north of Chicago, is often affected by direct sunlight. One of our customers indicates that a Rocky Mountain rink uses a unique shading system. Can you tell us where we might learn of this? Is there any refrigerating practice we can use to offset softening of the ice on days of strong sunlight other than shading?—
J.J.R., Chicago.



Correct Purging Point

QUESTION: When an automatic purger is used, is a purge connection from both the receiver and the condenser required? Or is the purge connection from the receiver only sufficient?

The following conditions are applicable:
(1) Only one condenser and one receiver are involved.
(2) The condenser is evaporative in one installation; shell and tube condenser supplied with water from an atmospheric cooling tower, in another.

Referring to the accompanying drawing, will purge connection "A" from the receiver give sufficient purging? Or, should purge connections be provided at "A" and "B", with purging being done either from the receiver or the condenser, as may be required?

—T.H.R.&D.D.W., Chicago

Oil in Evaporator

QUESTION: I am operating a Refrigeration-11 centrifugal compressor. I have added a lot of oil to maintain my oil level and I believe it is all going over and staying in the chilled water evaporator.

Is there any way to tell how much oil is in the liquid refrigerant in the evaporator?

What amount of oil will affect operating conditions?

How can I get this oil out of the evaporator?

—N.M.D., Chicago.

Reflective Insulation

QUESTION: Insulation recently applied to an addition to my cold storage plant went over sheets of aluminum for exterior walls and under similar sheets for the roof. I applied the aluminum foil not only for its vapor barrier values but for reflective characteristics as well.

Later when I built a new home I tried to persuade my contractor to do the same. He argued that this practice had very little value in home construction and quoted me an exorbitant price when I asked him to investigate. Yielding to an expediency at the time, I have since felt that perhaps I should have put the time and effort into placement of aluminum foil or reflective surface inside my fibrous insulation materials in my new home.

—B.C.M., Toledo.

Air In System

QUESTION: What is the possibility of air entering a refrigerating system via venturi effect in high velocity suction lines operating at 15 psig; say through a cracked flange or a flared fitting?—B.H., Nojave, Calif.

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NATIONAL *Refrigeration Coils*

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H. Cecil Rhodes, Managing Director

ASHAE, ALL-INDUSTRY CONFERENCE ON CONTROL
May 14, 1958
ASHAE Research Laboratory, Cleveland, Ohio
H. W. Alyea, Chairman

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
June 11-14, 1958
Chase-Park Plaza Hotels, St. Louis, Mo.
Kenneth E. Trombley, Public Relations

AMERICAN SOCIETY OF HEATING & AIR CONDITIONING ENGINEERS
June 23-25, 1958
Nicollet Hotel, Minneapolis
W. M. Vidulich, Public Relations

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
June 23-25, 1958
Leamington Hotel, Minneapolis
R. C. Cross, Executive Secretary

CANADIAN ASSOCIATION OF ICE INDUSTRIES
October 6, 7, 8, 1958
The Chantecler, Ste. Adele, Quebec
Mrs. Mildred E. Croft, Executive Secretary

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 11-13, 1958
Kenilworth Hotel, Bal Harbour, Fla.
Charles W. Moneypenny, Chairman.

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December 7-13, 1958
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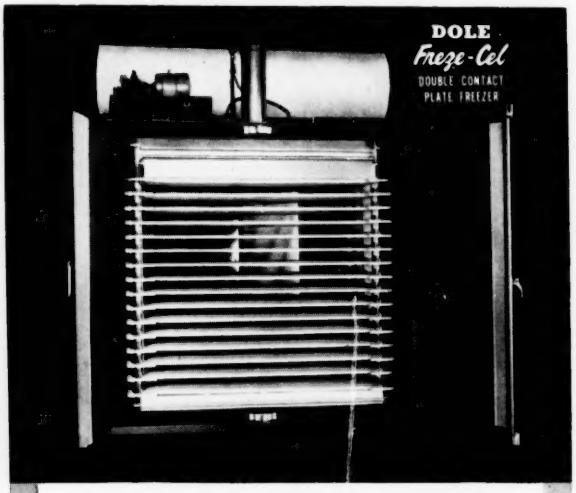

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John Mariakis

Members-at-Large

»»» POSTMEN take a holiday by going on a hike—bus drivers are reported to vacation on sight seeing trips—the sailor rows his girl around the park lagoon, etc. Now what does a refrigeration engineer do when he retires? He goes into the refrigeration business of course!

Henry Spencer Fromberger, a member-at-large of NAPRE, retired recently from the air conditioning and refrigeration department at the Charleston, South Carolina, Navy Yard. "From", as he is better known, had gained considerable experience in the Maritime and Naval service prior to his employment in the Navy Yard where he installed, serviced and maintained refrigeration both in Marine and Public Works Divisions.

Fromberger is now associated with Quarles Refrigeration Co., Savannah, Georgia. Although the firm has specialized over the years in commercial refrigeration work, both ammonia and halogen refrigerants, they are now expanding their service to include industrial applications. The firm has acquired larger quarters recently and are expanding their territorial coverage on a very limited scale. Last year the firm acquired a York dealership which completed their commercial line of restaurant and market equipment.

Being a native of Florida and having drifted up Carolina way on a Gulf stream, Fromberger has promised attendance at the November 11-13 annual NAPRE meeting to be held at Miami Beach, Florida. Having the benefit of a few more years experience due to seniority, Fromberger felt that he will be a much more reliable guide for convention goers than the younger generation who formed the Greater Dade County Chapter a few years back.

Combination Career

Imagine being a master brewer and engineer also of a modestly sized brewery! Well, member-at-large M. A. Gabler of John Havenstein Co. of New Ulm, Minnesota, is just that. Combining those two careers wasn't complication enough apparently, for Gabler also manages and operates a 150-ton ice plant in connection with the brewery. He has been 17 years with the firm.

Gabler got his theoretical engineering through courses at the University of Minnesota prior to World War I. During that war he served as an engineer officer in the U.S. Navy, which, Gabler notes, made it clear to him that theory was of great importance to do ones work more efficiently. Combining practice with theoretical background makes more complete training, which, of course, is the objective of NAPRE. Gabler concludes his remarks by stating that the papers published by NAPRE in IR, the OPERATING DATA BOOK, and circulated separately have always been interesting and informative.

Phil Gilmore, former secretary of Tacoma Chapter, who is now busily occupied with other members-at-large in reforming the Portland, Oregon Chapter, wrote recently "sorry to inform you Russell Ewen who worked for me at Northwestern Ice & Cold Storage, died suddenly last month of a coronary attack. He was always a loyal member of NAPRE, even when the former chapter dissolved here. He wrote quite a few letters of information as a member-at-large to INDUSTRIAL REFRIGERATION magazine, which helped to keep interest in NAPRE alive in this area when there was no local chapter. I was hoping for a lot of help from him forming this chapter; he certainly will be missed."

—John N. Mariakis

News Notes and Chapter Activities

Greater Dade County Installs President at Home

NORTH MIAMI—Making most of circumstances, unusual as they may be, has always been a tradition with NAPRE. Greater Dade County Chapter and its president, Richard H. Wiskeman, demonstrated this fact once again in an even more exceptional situation.

Elected to office last December, Wiskeman was taken ill before he could take office as president of the NAPRE Chapter. After a long stay in the hospital he was able to be up long enough to entertain his friends and brother engineers at a regular business meeting. The meeting took place in Wiskeman's home, 14200 NE 16th Avenue, North Miami, Wednesday, March 12.

Mayor Thomas Sasso of North Miami acted as master of ceremonies. Rev. B. F. Schumacher of the Holy Cross Lutheran Church opened the meeting with invocation and Peter Bergman, retiring president, installed Wiskeman and presented his gavel.

Taking office at the same ceremonies was vice-president James T. Jackson, chief engineer, McAllister Hotel; secretary-treasurer Charles W. Moneypenny, chief engineer, Hotel Kenilworth, and sergeant-at-arms Bert C. Cates, chief engineer, Hygrade Meat Packing. (Moneypenny has also been designated as the convention chairman for the 49th annual meeting, NAPRE, which will be held at the Kenilworth Hotel, Bal Harbour, November 11, 12 and 13.)—E. B. UTESCHER.

Richard Wiskeman, seated, president of Dade County Chapter, NAPRE, is installed by the retiring president, Peter J. Bergman.

Stockton-Modesto Elects

STOCKTON—Officers for the San Joaquin "two-cities" chapter for 1958 are President Walter R. Nehring; Vice-president Manuel Lopez, and Secretary-Treasurer Harry C. Dyer. Educational committee appointed consists of John Panizza, Guy Vancleave, Jay Jackson, Waino Menkkinen, Merrell Holland, Ted Hornbacker. New membership committee consists of John Panizza, Waino Menkkinen, Fred Jones, H. Greenwood, Tony Steingruber.

The new officers were elected and committees appointed at the meeting on February 5. At that meeting the program committee presented two films, one covered metalizing of equipment . . . . in refrigeration and other industries. The other film covered corrosion, which the members believed worked in just right with the topic of metalizing.—H. C. DYER.

Northwest Conference

SEATTLE—Washington Chapter No. 1, NAPRE, will host Pacific Northwest Chapters at a regional conference on June 7. Members-at-Large and chapters are urged to make reservations with Wm. E. McCorkle, Jr., secretary, 12643 10th So., Seattle, 88. – M. E. BELL.

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You have a choice of either portable or stationary types with gasoline engines or electric motors—capacities from 15 to 60 tons per hour. Ice particles are delivered uniformly to all corners and crevices for maximum protection. For complete information on Ice Crusher-Slingers see your nearest Link-Belt office. Or write for Book 2382.

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Jackson NAPRE Educational Conference Features Top Flight Program

»» NATIONAL officers of NAPRE who attended the Jackson, Mississippi, Regional Educational Conference pronounced the educational program to be one of the best planned and executed, as well as of top flight educational value. Delegates from four south central chapters and five states attended the 2-day sessions held at the Heidelberg Hotel on Saturday and Sunday, March 8 and 9.

Following a welcome address and invocation engineers were addressed by Forrest H. North, a design engineer of the First National Bank Building, Jackson. Showing an unusual knowledge of and appreciation for services of the practical engineer, Speaker North described the design, erection and installation, and operation of the absorption refrigeration plant located atop the roof of the bank.

Practical engineers were surprised by the speaker's frankness in pointing out design errors made in the installation. North outlined some oversights and stated remedies which had been applied by his firm. Few members in attendance could recall when a consulting engineer took the trouble to point out his mistakes to a group of operators.

One unique feature which engineer North pointed out was the fact that his consulting firm has been retained by the bank management to supervise the operation and maintenance of the equipment. Although operating and maintenance personnel are actually employees of the bank, the firm of consultants has direct responsibility for their activities in connection with this high velocity induced air and circulating chilled water air cooling, and warm air heating system.

Following North on the program was Don Ingram of New Orleans. Ingram outlined the system of automatic temperature controls used for the First National Bank Building. Controls are of the pneumatic type used in connection with air handling, chilled water system and refrigerating equipment. Boiler plant controls are also pneumatically operated.

Balance of the Saturday morning session was taken in a tour of the bank building plant. J. L. Lackey, plant engineer and member of the Jackson Chapter, together with Ingram and North served as guides. The roof top installation consisted of two Cleaver-Brooks boilers, two Carrier Corp. improved water vapor type absorption systems, together with the necessary water heaters, water chillers, associated piping, heat exchangers, fans and controls. Approximately one-third of the roof area is occupied by the machinery house, another one-third is occupied by the Marley induced draft cooling tower, with all machinery effectively concealed by an architectural arrangement. The entire plant was color-coded in accordance with ASA specifications.

Insulation applications, both for refrigerated enclosures and for pipe and pressure vessels, was the topic that led off the afternoon's educational program. D. L. Chamberlain, MMM, Inc., Houston, led a discussion on industrial insulation misuses and abuses, following the presentation of a film which depicted proper applications of polystyrene insulation.

John Funel, Equitable Equipment Company, New Orleans, led a discussion on the uses of vertical multi-cylinder compressors. Using the Vilter equipment as an example he drew comparisons between compressors used in booster and high-stage applications, and between those used for ammonia and other refrigerant systems. Specifically outlined was the advantage of interchangeable parts in plants where both boosters and high stage machines are the same size or model. Flexibility of operations was also pointed out both through the use of the number of machines and the unloading of cylinder banks with declining loads.

Swift Plant Tour

Attendants were given the VIP treatment with the afternoon tour. Police escorted visitors to the new Swift & Co. slaughter house and meat packing plant located at Jackson. Jim McClaine, chief engineer, and his assistants were hosts at the Swift installation. Although the slaughtering facilities were not in operation, visitors obtained a very good idea of how beef and calves on the hoof are turned into steaks and roasts, hamburgers and hides, in this newest of meat packing plants in the south. Tours were made in the various preparation rooms, coolers, freezers and eventually the refrigerating machinery room.

National NAPRE President Frank L. Chase, was introduced at the dinner meeting. He in turn introduced past national president, Leo. J. Vivien, who was also in attendance and national secretary, J. R. Kelahan. Following the dinner, conference guests enjoyed dancing on the Heidelberg roof.

Following Sunday church services, the conference ended with a chapter clinic luncheon. NAPRE's National Secretary addressed the luncheon meeting. Assisting with the question and answer session that followed were other national officers and the speakers who had appeared on the previous day's program. Also appearing on the program was Thomas P. Stevens, State Supervisor, Bureau of Apprenticeship and Training, U.S. Department of Labor. Stevens answered many questions that some of the newer chapters had concerning assistance for training.

Conference Chairman was J. R. Thompson, president of Mississippi Chapter. Speaker Chairman was Charles E. Warwick. A. G. Liss was Chairman of the Sponsors Committee and D. G. Sanders was Conference Treasurer. Sponsors were Anderson Chemical Co., Equitable Equipment Co., Inc., Mississippi Power & Light Co., Mississippi Valley Gas Co., Munford Engineering Co., Noland Plumbing Wholesale Co., and Swift & Co.

NEW!

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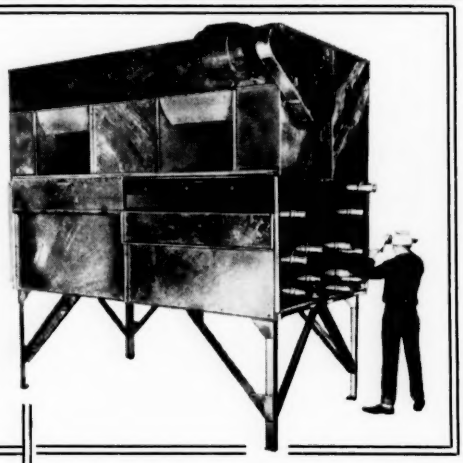

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Productive Maintenance—Rocky Mountain Topic

DENVER—Productive maintenance is the application of men, tools and material to protect capital investment, and to increase product activity. This productive maintenance is a working positive thing. It doesn't just prevent something; it produces. It doesn't mean added operating costs; it means added profits. And once more, it is practical, realistic, and attainable. This is how R. L. Fallander, General Electric Company, addressed the members of Denver Chapter, NAPRE, at a late February meeting.

Area of productive maintenance does not by any means reflect its importance only in a manufacturing plant. Proper maintenance is important in any business which has within its realm any type of equipment requiring periodic maintenance. Refrigeration and air conditioning equipment is certainly not an exception. The air lines, for example, schedule periodic overhauls of their aircraft and equipment very carefully. In this case human life is involved and carelessness or inattention would be disastrous. Even where human life is not at stake, downtime can be financially disastrous. But it can be prevented.

Maintenance Steps Outlined

There Are Five Steps in a Productive Maintenance Program:

1. Gather complete equipment data on all machines and motors in use.
2. Evaluate routine maintenance so that equipment costs will show you how much care is warranted.
3. Establish a routine operating control system.
4. Evaluate where critical maintenance needs are required.
5. Establish a critical maintenance program.

Fallander, assisted by Larry Sparo of General Electric's Denver Shops, distributed productive maintenance kits for those members in attendance and followed up the presentation with a slide film on the same topic.

Practical Experiences

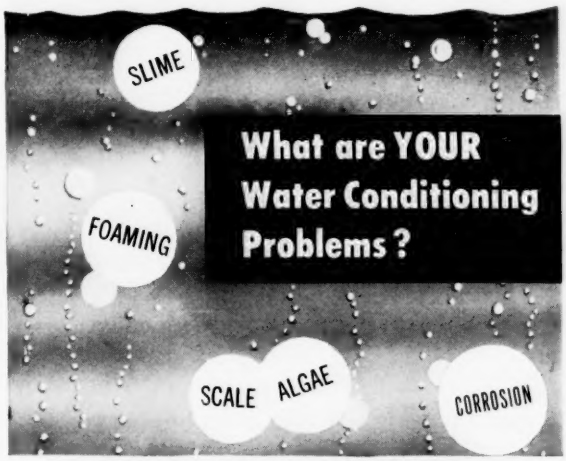
A question and answer session followed the film presentation. This was a very practical discussion as the speakers had brought with them a "Megger," a hook-on ammeter, and an AC voltmeter. They demonstrated, using members in the audience in active participation, how to take insulation tests on motors, power and lighting circuits, etc. Load readings were taken with the ammeter and voltage checks were demonstrated by means of the three instruments. Actual use of the instrument, not only cleared up any doubts concerning the importance of these instruments in trouble shooting but served as an instruction period on the proper use of test apparatus. Refrigeration Distributors, Inc., Denver, made the program possible. — FRANK DIDONATO.

Mid-South Makes Bread

MEMPHIS—Members of Tennessee Chapter No. 1, NAPRE, had an opportunity in March to learn refrigeration applications in a modern bakery. A tour was made of Hart's bakery plant through the cooperation of Ben Borden, manager, E. W. Hertzog, bakery superintendent and A. R. Scott, chief engineer. Refrigeration is applied to control temperature humidity in ingredient storages, proof rooms and during the post-baking, prewrapping stage of production. Over 200-TR is used for bread manufacturing and general air conditioning. For the members bread making efforts that evening, each was presented a hot fresh loaf. The chapter lost a very good member in Charles W. Burns, former chief engineer of Clover Dairy Co. who died in March at Baptist Hospital. He is survived by his wife, 3 sons and 7 daughters. — CHAS. CONLEY.

Northern California Leaders

SACRAMENTO—Officers elected for the 1958 term at California Chapter No. 3, the leading chapter north of the Central Valley, are as follows: President, Leonard T. Davies, chief engineer, Safeway Stores; Vice-President, Robert Skidgel, electrical repair dept., Pacific Fruit Express; Secretary, Cecil L. Cole, chief operating engineer, National Ice & Cold Storage Company, and Chapter Reporter, David Sorocco, manager, Sorocco Sheet Metal Works.—JOHN MULLIN.



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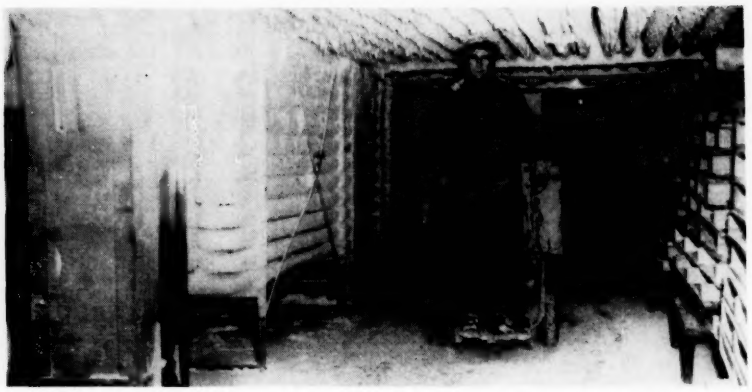

In Low Temperature

THE IMPORTANT IS

»» TWO OLDEST ACTIVITIES of man—food preservation and materials handling—have been making spectacular advances in the last 30 years. Birdseye's innovations in quick-freezing and some unknown individual's development of the fork-lift truck, which occurred almost simultaneously, have had far reaching effects. Statistics on the conversion of cooler to freezer storage are significant of the impact frozen foods have had on the refrigerated warehousing industry. A walk along the platforms of any modern ice-cream plant shows what unit-load handling has meant.

More extended use of low-temperature processing and the increased tempo of modern handling methods have had reciprocal effects. Colder environments have called for changes in certain features of building construction, notably in the passageways for mobile equipment, and handling machines have had to be adapted to more abnormal conditions. Further, improved handling techniques have resulted in new operational methods, as in order-picking for distribution.

Although many novel machines have been developed for the processing of frozen foods, equipment used for handling packaged products of this industry consists of standard machines, modified or adapted to operate under the severe conditions which low temperatures imposed. There is one factor which, to a great extent, accounts for this lack of new, specialized handling devices. Rectangular containers, such as fiberboard cartons, make up one of the most satisfactory kinds of unit loads, and these predominate shipping container used for distributing packaged frozen foods. Consequently, skids and pallets fit naturally into the field. All that has been required is to adapt the machines to operate successfully both in and out of cold rooms.

Unit-load handling is not the only means employed for moving packages in low-temperature environments. Conveyors have operating characteristics which make them ideal machines for handling individual containers. However, they must be selected with care, (particularly if they have belts), and certain precautions taken to fit them for such applications. Cartons on conveyors are kept moving in steady, continuous flows and present day trucks are operated at optimum safe speeds with the radical changes that have taken place in door designs, which prevent undue loss of refrigeration. Our purpose here is to discuss these various aspects of handling in this relatively new kind of activity.

Trouble Factor: Humidity

Cold is not the serious factor in the problem of operations at abnormally low temperatures. It is the presence of **humidity** that causes most of the difficulties in adapting equipment to operate satisfactorily under sub-freezing conditions.

When relatively warm, moisture-laden air moves into a cold room, or machines are used alternately in contrasting temperatures, condensation results. Condensed moisture causes corrosion and, within the room, the formation of frost and ice.

Mobile Equipment— Keeping It Fit

Among the machines encountered in sub-freezing product handling activities are mobile racks, semi-live and dead skids (the former with their characteristic jacks and the latter with low-lift hand and powered trucks), and conventional flat-surfaced platform or warehouse types of hand trucks. For moving unit loads on pallets are low-lift hand trucks, and both "walkie" and operator-ride powered units. For tiering pallet loads there are mobile, powered outrigger stackers which tier from relatively narrow aisles; counterbalanced type stackers; and, of course, conventional high-lift fork trucks.

All these machines present the common problems of running gear selection and lubrication, in addition to protection against corrosion. Particular attention must also be given to hydraulic systems used in lift trucks. Because they are free of noxious exhaust fumes which are dangerous in confined areas and which may contaminate foodstuffs with which they come in contact, electric-powered trucks are utilized. Therefore, operating firms must concern themselves with the care of the truck's electrical system and the functioning of storage batteries under low-temperature conditions.

Lesson From Aviation Firms

Major oil companies have devoted a prodigious amount of research work to the development of oils and greases for aviation where today, planes zoom from normal, and sometimes tropical environments to the extreme cold of upper space. The results of their findings are available to oil users in every field and most equipment manufacturers are well-informed on the fine points of proper lubrication. Their recommendations should be sought and followed in connection with lubrication problems.

Lubrication, to be effective, must be on a scheduled basis. Workers in a cold storage plant complained that the trucks were getting harder to push. Removal of the wheels disclosed that the grease had turned to a dark brown powder! Regardless of how carefully the right oil or grease is selected, it will not be effective unless it is applied regularly. Lubrication records should be kept and each machine serviced to an established schedule.

Materials Handling-

FACTOR NOT THE COLD . . . IT'S THE HUMIDITY

By D. Oliphant Haynes

Hydraulic Systems are dependent in great measure upon the kind of oil used. The problem of oil selection is complicated when the truck operates part of the time in a sub-freezing environment and alternates this activity with work in "normal" atmospheric conditions. The oil must have proper flowing characteristics at low temperatures, but at the same time, sufficient body to permit the development of adequate working pressures when it is warmed up. This is, fortunately, less of a problem today than formerly because of research.

Rubber Tires do not function satisfactorily at low temperatures. Cold storage freezer trucks left standing with a full load are often frozen fast to the concrete floor. Steel wheels do not freeze to floors, but damage the surface.

Advances are being made in the development of composition tires for powered trucks. For example, these made of neoprene give good traction, even on slippery surfaces and function well in cold rooms. More recently a new type of tire for small wheels made of polyurethane elastomer which the manufacturer characterizes as being "strong as steel, resilient as rubber", are proving to be satisfactory at low temperatures. But developments are rapid, and the user should consult equipment manufacturers for his particular requirements.

Corrosion-inducive conditions have prompted some manufacturers of fork lift trucks to offer special models. Features of such trucks usually include nickel-chromium plated hydraulic rams and undercoated chassis. If trucks are not so conditioned, exposed

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parts liable to corrosion should be protected by properly selected paint, and moving parts coated with a thin layer of grease.

The contacts of electrical control switches must be given careful maintenance attention under the in-and-out type of operations we are considering here. If keeping them bright and lightly lubricated are not sufficient, it may be advisable to install a small heater within the switch compartment. Such heaters which operate on current from the battery are now available and are good uninterrupted service insurance.

Storage Batteries function by chemical action, and . . . all chemical actions are retarded by low temperatures*. There are a number of conditions which act to prevent a lowering of the electrolyte temperature below a satisfactory operating range. Among these conditions are: (1) the heat generated within the cells of the battery by the passage of current during both charge and discharge, (2) the low rate at which heat is transferred outward through the battery box, and (3) the relatively short time per day that a battery is usually exposed to extreme temperatures.

Operating Precautions With Storage Batteries

Among tests cited which were conducted by a testing laboratory is one in which an Edison battery enclosed in a box with restricted ventilation was exposed to temperatures ranging from 7 F to minus 15 F for eight hours, without current, either charge or discharge, flowing through the battery. When the battery was placed in the room it had a temperature of 82 F and at the end of the test it had fallen but 17 degrees to 65 F.

Although there is little danger of harm to batteries exposed to low temperatures, certain precautions should be observed. Those selected for this service should have ample capacity for the work they are to do. Much capacity is better than too little. If necessary, ventilation of the battery case can be restricted.

In many applications booster charges during the lunch period are advisable. The machine and its battery should be moved to locations where higher temperatures prevail during periods of inactivity and for charging. Air-conditioned charging room aid in the rapid removal of condensation, being beneficial both to trucks and batteries.

*Technical Fact Sheets; Edison Storage Battery Div., McGraw Edison Co.

About the Author . . .

Consultant in materials handling major warehousing and fruit processing firms, D. Oliphant Haynes gained his practical experience as a warehousing vice-president for Merchants Refrigerating Co., New York. He is author of two books on handling equipment and applications, has been a contributor of ten major papers to this publication, served on the ASA Safety Committees in this field and has led a number of conferences for TRRF.

Conveyors

Gravity, powered belt and flexible chain conveyors are the most usual types found in cold applications. They function with little attention where humidity is low. However, very real problems present themselves when a conveyor carries its load from cold to normal temperatures, or vice versa.

Belt Conveyors are indicated in preference to other types where the packages to be moved are not uniform in size (length and width). Fabric belts should be interwoven construction rather than ply-on-ply, as a precaution against separation. Bed of the conveyor (slide or roller) should be two inches wider than the belt because of the difficulty in "training" a stiff belt—that is, in making it run true.

A slide bed is preferable where humidity is high and freezing takes place. Under such conditions it is difficult to keep rollers from becoming inoperative during idle periods. Rollers which do not turn wear a belt out very rapidly. Sleeve rather than antifriction bearings are used in cold applications. Oil lubricated bearings when impregnated with antifreeze solution or non-lubricated nylon bearings are very satisfactory. Silicone oils and greases are relative newcomers in this field.

Drive and the tail rollers for belt conveyors should have larger diameters than are normally used, to prevent excessive flexing of the belt when it is stiff from the cold. Being indispensable at the head and tail ends of the conveyor, these should be fitted with grease-sealed bearings.

Linked rod, woven wire and steel band are other types of belts applicable to cold operations. In order to prevent steel band belts on which ice has built up from losing traction, special V-belts are bonded to the under side of such a belt and these provide good driving contact with the head pulley.

Flexible Chain Conveyors can be used to handle uniform-sized packages only. Outstanding advantage offered by conveyors of this type is that they provide positive driven curves. Although they consume 15 to 25 percent more power than other varieties, their operating advantages usually offset this increase in costs.

When a chain conveyor carries packages from a low-temperature area to one where it is relatively warm, frost build-up becomes a problem. The best way to meet this situation is to provide two separate conveyor units. For example, if the flow is from a cold holding room to a truck platform, one conveyor would stop just short of the access door and a second would then carry through the door and out onto the platform. The second unit can be driven by a jackshaft so that both units are powered by the same drive motor.

Should a lubricant be needed to keep the flexible chain from freezing to the metal tracks, one must be selected which will not mark the surfaces of the articles being conveyed. Anti-freeze compounds have been used successfully in such situations.

Protecting Power Units

Correct oils and greases must be selected for the motor and transmission parts. Where moisture-freezing conditions prevail, control boxes should be tightly enclosed or placed in more favorable environments. An infrared lamp or a small heater unit provide excellent protection. Cost of operating them in refrigerated rooms is infinitesimally small compared with the benefits derived from their use. Somewhere in the transmission a shear pin should be provided to protect the drive mechanisms should the machine be started up when belt or chain is frozen tight.

Holding the Cold Front

Although intended primarily to minimize refrigeration losses and the formation of frost and ice, barriers between spaces with contrasting temperatures must be so designed and constructed that they permit unimpeded movement for machines and materials. Cold storage doors therefore have been changed radically to meet new materials handling requirements. Completely different types of barriers may even be in the offing.

Cold Storage Doors of the walk-in or drive-through variety have two lines of development—lighter construction, and automatic opening and closing mechanisms. One manufacturer now offers a door that weighs as

little as 3½-lb/sq ft. Former cumbersome doors weighed as much as 10-lb/sq ft. New doors ride on tracks which slant downward and slightly inward so that they are in a sealed position when closed. Improved insulating materials are used, and ice formation between the door and its frame eliminated by the use of heating cables. (Developments are announced almost month to month in the advertisements of leading manufacturers in this field).

Safety is important. Door construction should include: a safety edge to cause the door to re-open automatically should it contact a person or other obstruction while closing; a manual release to permit operation in the event of power failure; and, if a locking device is used, it should be so constructed that a person accidentally locked in can free himself.

Automatic door opening is a practical necessity to make full use of potentials in modern handling equipment. Control mechanisms used for this purpose employ magnetic contactors, relays, etc. These must be protected from freezing, either by being placed outside the cold room or by making use of such means as a 100-watt light bulb or heater.

Properly located pull cord and push button switches permit the operator to actuate the door without dismounting from his machine, but newer and more fully automatic control makes use of an electric eye. This device can be used alone or in combination with a pull-cord setup. A time relay can be used to hold a door open for a predetermined period of time; a useful provision where trailer trains are used.

Auto-close doors have also felt the impact of today's handling techniques. Where applicable, these doors provide barriers which can be pushed open by trucks passing through without the operator leaving his machine. These doors are now available with exterior casings made of natural rubber or of grease-resistant neoprene. With proper air seals, cam shields and graphite lubrication, these doors close off rooms in which the temperature is as low as minus 40 F. Special wear panels are provided to protect the doors against damage.

Careless machine operation, particularly in connection with automatic doors, can be both dangerous and costly. Regardless of the protective barriers provided, adequate operator training and strict enforcement of safety regulations are essential if repairs are to be kept to a minimum and service maintained.

Conveyor Doors are practical where a section of conveyor cannot be removed from the opening through which it passes. Door is shaped to fit over the conveyor frame and edged with air sealing materials. To minimize refrigeration losses where chain conveyors are used, return chains can be run through three inch pipes fitted with sponge rubber plugs in which an X is cut.

Novel Passing Arrangement Proves Most Practical

Problem of passing ice cream containers from a processing room into a blast freezing tunnel was recently solved for an installation made by Island Equipment Corp., without using a physical barrier in the wall opening! Filled boxes of ice cream are carried up an inclined belt conveyor and discharged onto a downward-sloping chute which leads them to a double-deck woven wire belt conveyor in the tunnel. Because the opening in the wall slants down toward the colder environment a natural air barrier is provided. It is proving to be a very effective air seal.

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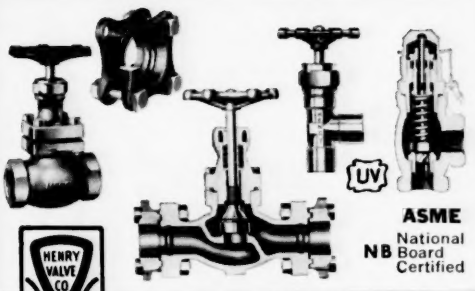

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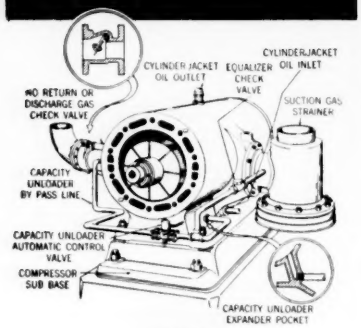
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Picking racks are proving practical in small quantity order-filling operations.

Another type of cold barrier holds possibilities in the future. Air curtains originated in Switzerland have been successfully used to maintain temperatures in air-conditioned department stores, supermarkets, and banks. This new barrier is now being investigated by large cold storage warehouse organizations. It is too early to state definitely whether or not this method is practical under sub-freezing conditions, but it is a development well worth watching.

Small Order Distribution From Storage Centers

Changes in handling techniques have had marked effects on the distribution of all kinds of products and frozen foods are no exception. One problem common to mass distribution in all fields is to make individual packages ready for assembly into small delivery orders. Most satisfactory solution to this perplexing problem is the picking rack. Packages are so arranged that when a single item is removed from a line, another moves forward to take its place.

Introduced originally for use in warehouses where normal temperature conditions prevail, this method is now being set up in sub-freezing breakup rooms. Racks in which the packages slide down metal runners have been tried out under cold working conditions but have not been found to be satisfactory because the packages have a tendency to "hand up". However, "live" racks with two rows of wheels on which the packages roll freely are functioning perfectly at temperatures as low as 0 F.

The Alvey-Ferguson Company recently installed a storage rack of approximately 640 lanes to handle frozen foods in Gaudio Brothers' cold storage room in Philadelphia. Wheels used in the racks are fitted with labyrinth type ball bearings packed with appropriate low-temperature lubricant. The temperature in the room is kept relatively constant and, since there is no difference in temperature between the steel components in the rack and the surrounding air, there is no tendency for frost to form on any portion of the system.

Refrigeration Accident: Two Deaths At Knoxville

»» AMMONIA inhalation caused the deaths of two workmen, serious injuries to two more and hospitalization for seven other persons in an accident in a plastics plant in Knoxville, Tenn., on March 14. No explosion or rupture of a vessel took place, nor was there any fire or explosion in the area in which the ammonia was liberated.

Plastics process cooling is accomplished by means of chilled water. Water at the Knoxville plant is refrigerated by a 400-ton ammonia cooler. According to reports the repair crew had completed work on the cooler and had just started work on an ammonia condenser. Apparently the repair crew attempted to remove a tube from the condenser which still contained liquid NH_3.

Liquid refrigerant spread from the vessel over the four workers. Two were apparently burned and asphyxiated by the sudden release, and the other two suffered third degree burns of the face and body and near asphyxiation. The other employees were hospitalized for possible inhalation of excessive fumes.

—Milk Concentrates—

Beatrice Develops Acceptable Reconstitute

Longer Keeping at Cooler Temperatures, Extends Vital Armed Services Supply in Pacific

»» MILK has been air lifted from Hawaii to the distant Pacific Islands of Midway, Eniwetok and Kwajalein as there are no dairy herds on those islands. Need by the Defense Department for a stable milk supply has been vital but there has not been enough space for half the milk the military activities have needed.

Military-civilian cooperation between the Naval Supply Center at Pearl Harbor and Dairymen's Association Ltd., Hawaii's leading dairy, achieved the creation of a new "three-in-one" concentrated recombined milk, which saves the Navy invaluable transportation space on ships and planes.

Recombined Milk Improvement

The pressing need for more milk at Midway and Kwajalein was being solved only partially, by flying fresh and recombined milk in specially constructed insulated bags. A concentrate might enable the shipment of triple the amount being sent. If a long shelf-life could be achieved, the milk might be shipped by boat, greatly increasing availability of the product and reducing costs.

The research division of Dairymen's Milk Division (a division of Beatrice Foods Co.) already had perfected a highly-acceptable recombined milk. The next steps then were toward developing concentrates. Dairymen's presented the problem to Beatrice Foods' General Control and Quality Laboratory in Chicago. Dr. Geo. W. Shadwick was soon on his way to Hawaii by plane with a refrigerated container carrying samples of a new concentrated recombined milk representing the combined efforts of Dairymen's Hawaiian and Beatrice Foods' (Chicago) research and development.

Civilian-Navy Teamwork

At meetings in the offices of Admiral Joel D. Parks, Naval Supply Center, Pearl Harbor and Vice President George Q. Cannon, Dairymen's, there was a discussion and sampling of the new product. Those present were impressed with the palatability of the product and its flavor.

Dairymen's in Honolulu reproduced the recombined milk concentrate and added a chocolate "three-in-one" concentrate as well as a diet non-fat milk product. The Navy then instituted a wide sampling program while the USN General Supply Depot Technical Advisor set up a laboratory testing and control program. The sampling showed the product was acceptable.

Sea and Shoreside Tests

As additional quantities of the two products were being manufactured, the technical advisor was storing and testing samples in the General Supply Depot cold storage facilities. They were checked regularly after a lapse of ten days to determine the protein stability, acidity, flavor and appearance. It was found that the life of the product was as high as 40 days for the white milk concentrate at a stable temperature above freezing.

For the chocolate concentrate the life of the product ran as high as 81 days. Regular shipments were sent to Midway and Kwajalein. The USS KARIN, reefer ship on a cruise to New Zealand, used the white milk 30 days before the supply ran out.

Civilian Consumption Rises

In the meantime, Dairymen's demonstrated both the recombined white milk concentrate and the chocolate product to Pearl Harbor Commissary Store customers. People are now making regular purchases, although the product was designed for distant island posts where there is no regular fresh milk supply available.

For the consumer, the process of converting the concentrate into milk comparable in flavor and texture is simple. Addition of two quarts of water to one quart of the white milk concentrate produces three quarts of milk with a minimum butter fat content of 3.5 percent, well within state and national requirements.

Production of the new concentrates begins in Beatrice Foods' Meadow Gold plant in Boise, Idaho. Butter fat is removed, fluid skim milk powdered. Milk powder and butter fat then are shipped to Dairymen's, which recombines the basic elements.

Univ. of Wisconsin Announces One Also

No Tie Between Them

»» AS PREDICTED by Dr. W. E. Price, University of Wisconsin Agricultural Experiment Station, in his report to the TRRF Scientific Advisory Council on March 6, details of a new milk concentrate manufacture was announced at public and technical meetings at Madison, March 19 and 20. The reports, of course, were in detail and technical. However, Bulletin 529, January '58, carried three short articles on the concentrate.

Refrigeration Helps— But Not Required

Milk concentrate produced by the process developed at Madison, will not require refrigeration as the product is a sterile one. However, it is expected the concentrate will be sold from refrigerated cases and the developers recommend that it be kept refrigerated whenever possible. They explained that the refrigeration prolongs the keeping period of the product and helps retain fresh flavor.

Cost Figures Gathered

Companion research of the concentrate development, was a collection of data on processing costs for the fresh concentrate. According to the Annual Report, Part I, of the University's Agricultural Experiment Station, cost range is from $2.50 to $3.00 per 100 lbs. of original milk, depending upon the capacity of the plant and the type of containers used. The concentrate could sell to stores for approximately 16 cents per can and, of course, would occupy one-third the space of fresh processed milk. The housewife would be able to purchase a week's supply of milk on one trip.

Made from Grade A milk, the concentrate is used as a beverage by mixing two cans of cold drinking water with the one can of concentrate. On cereals it is recommended that it be mixed one-to-one, and as a cream the concentrate should be used as it comes from the can.

Still another research project of the University is the development of high quality custards. The new concentrate makes better custards than fresh fluid milk, having less liquid seepage and firmer shapes.

What's New

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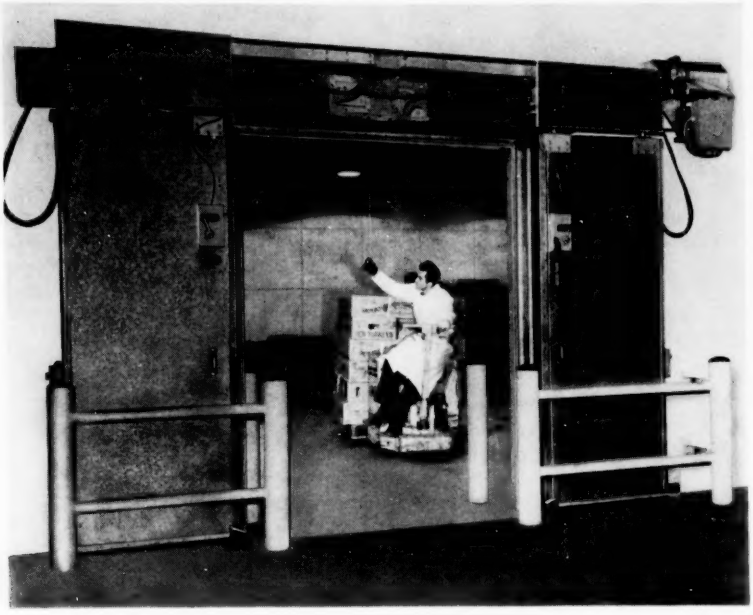

Power Operated Sliding Doors Reduce Refrigeration Loss

>>> ANOTHER line of power operated, horizontal sliding refrigerator doors is now available. Developed by Jamison Cold Storage Door Co., this remotely operated closure allows high volume movement of truck traffic with a minimum loss of costly refrigeration. Known as **Electroglide** they are available for both freezers and coolers in a range of sizes from 5x7 ft to 10x10 ft, with single or double leaf door.

Electroglide and other mechanical, remote operated, doors are especially useful when mechanical handling operations create traffic problems in busy warehouses, such as are described by Ollie Haynes on pages 34-38 of this issue.

Electroglide features include: compression seals on all edges, remote control switches, safety edge, lightweight insulation, emergency release padlocking and level ride opening and closing. Seals are made at all edges by a cam lock that moves the door in and down as the leaves close, making positive contact for all gaskets. In opening, the door moves up and out, immediately clearing gaskets from sill and frame.

Safety edge reverses the moving doors at any point of travel whenever the edge contacts personnel or objects. The door may be equipped with emergency release making it impossible to padlock someone in the storage area.

Gasketing For Auxiliaries

>>> GASKET materials for refrigerants and system auxiliaries have had two added developments in recent months by Armstrong Cork Co. High density asbestos gasket, one of the recent developments is marketed under the trade name **Accopac** AN-890. It is said to make possible for more efficient sealing of halo carbon refrigerants and is estimated to have a cost saving potential of 15 to 30 percent for compressor manufacturers. Developed after numerous tests, the material is specifically designed to resist effects of elevated temperatures, high internal pressure, and tendency of refrigerant to attack some gasket material.

Designed to eliminate seepage, leakage, of liquids and gases in applications where neither cork composition nor cork-and-rubber have been completely satisfactory, **Uniphase Cork** is the other material offered. Optimum combination of impermeability, conformability and chemical inertness is claimed. It is extremely resistant to fungas attack and has ozone resistance in excess of the best non-metallic gasket. The material seals at flange pressures of 100 psi, low, and 4,000 psi high.

Samples of both types of material are available as well as literature which describes their uses and applications of the material. Illustrations and a description of the test apparatus as set up at the Armstrong Research and Development Center for proving these products, is also available.

Iceller Stores Quarter Ton

>>> MAINTAINING a constant supply of ice cubes for resale or on-premise use is the function of the new **Iceller,** a 20-cubic-foot ice-storage case that holds up to 103 five-pound bags of party ice. Commercial ice manufacturers will be interested in these advantages: efficient, simplified storage, it fills a need in restaurants, institutions, taverns, drug and food stores, supper clubs and the room service departments of hotels. Some establishments use the **Iceller** instead of an ice-cube machine; others operate it is an auxiliary unit for storing reserve party ice for peak periods.

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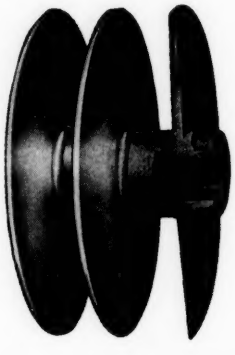

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Engineered Improvements Announced By Control Firm

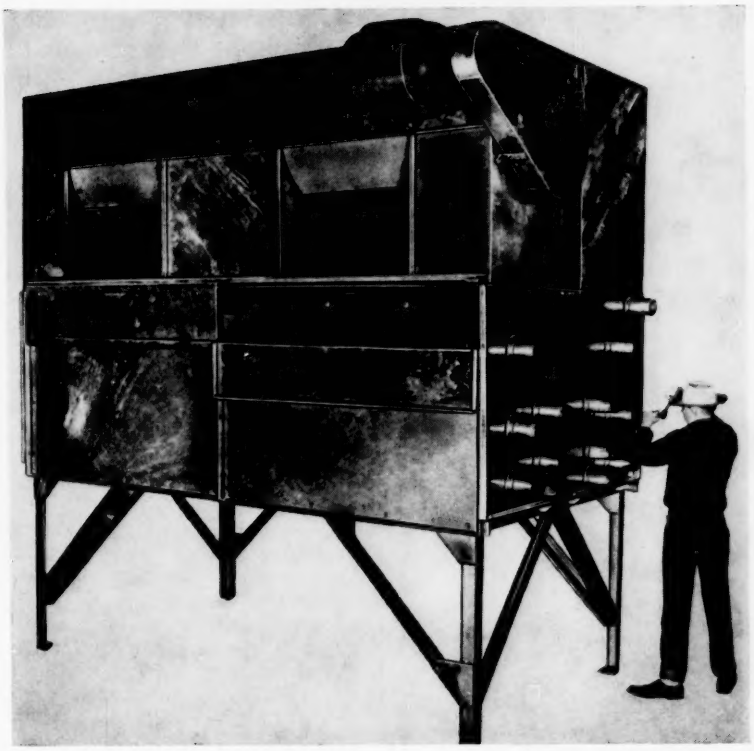
»» TWO engineering advances have been announced by Alco Valve Co. both dealing with their line of **Thermo** expansion valves. First is a new design for the power assembly, which limits the amount of flexing to which the diaphragm is subjected. Second is a new remote bulb and well design which gives a rate of response equal to, and in most cases, better than, the standard gas-charged thermostatic expansion valve.

Increased diaphragm life up to 10 times over standard power assemblies is claimed for the new design. Travel in a diaphragm is limited, thus reducing the extreme flexing experienced when the diaphragm is subjected to high pressures on the underside during hot gas defrost and on reverse cycle installations. Subjected to laboratory and field tests over two years, the design is now standard on all **T** and **HTL** series **Thermo** valves.

Designed to give more rapid response to temperature changes in the line, thus providing extra quick closing necessary for both protection against liquid floodback and optimum performance, the new remote bulb and well is available on gas-charged valves only, and offers several advantages over older style bulb assemblies. Better control over a wider range of operating conditions and variable loads, such as water chillers and hot gas defrost systems, is experienced.

Expanded Polystyrene Offer

»» BOXED samples of **Unicrest** are offered by the Plastics Div., United Cork Cos. to industry for examination and testing of this versatile plastic material. Ease of installation, low cost, and permanence, together with such properties as low rate of heat transfer, dimensional stability, resistance to moisture, fungi, vermin or rot, and its light weight, make this new substance an ideal choice for a wide variety of industrial applications, particularly low temperature insulation. Technical service department of the firm will advise prospective users concerning most advantageous applications.



Large Air Volume Blast Freezer

CUSTOM applications are easier met with new blast freezer unit just announced by Imeco Incorporated. Providing large air volume against the higher statics found in freezing tunnels, the freezer combines blower, cooling coils and defrosting arrangements in a compact unit. A wide range of air volumes and coil capacities are available; can be combined to obtain the correct balance for a particular application.

Available in six sizes, capacity ranges from 18 to 84 tons, and air volume from 31,000 to 75,000 cfm. Casing is heavy gauge sheet with sturdy structural supports which are hot dip galvanized. Balance of the unit can also be provided hot dip galvanized after fabrication, and drip pan furnished where specified.

Spray nozzles for liquid defrost can be provided, or the evaporator arranged for hot gas defrosting. Liquid defrost units are provided with large access doors for inspection of coil, and easy to spray nozzles.

Heavy duty blower wheels are mounted on large diameter shafts, access provided to all bearings, and external oilers located at convenient points. Complete fan and shaft assembly are balanced as a unit. Motor location can be varied to suit job conditions. Either finned pipe or bare pipe coils can be furnished. These can be circuited for thermal valve feed, flooded operation with a surge drum, liquid recirculation or brine. Dimensions may be altered to fit space restrictions. Unit can be shipped broken down to facilitate placing on location.

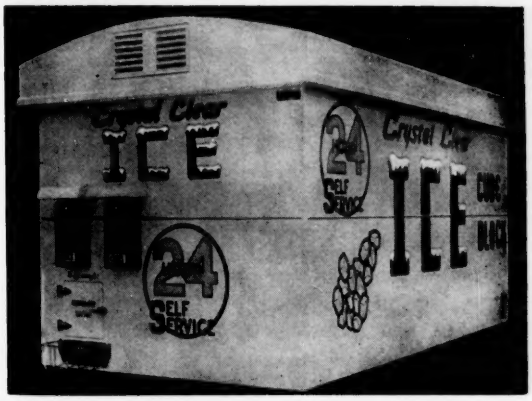
K. G. BROWN INTRODUCES THE NEW MULTI SCREW VENDOR FOR 1958

- **An increased capacity of 40% over previous models.**
- **Multi Single Line Vending of any size package or block, regardless of the type of tie.**
- **These new vendors are now made in lengths up to 20' which will vend 268 10# bags plus 132-25# blocks out of the same delivery door, (400 Sales).**
- **Up to 5 various sizes of blocks or bags can be vended from this one vendor.**
- **Radical invention, trouble free, more storage space by design, lower operational cost.**

NEW LOW COST 6' x 8' station vends 110-10# packages, or the "Junior", 3' x 7' station vends 90-10# packages using the new multi screw vendor.

ILLUSTRATED
9' x 16' Station vends 168-10# bags and 86-25# block.

K. G. BROWN MFG. CO., INC., MATTITUCK, N. Y.



For Hazardous Locations

There Is Only

ONE UL LISTED

REFRIGERATION CONTROL

MERCOID

SERIES DAE-50, 60

Series DAE for hazardous locations (Class I Group C & D, Class II Group E, F, G.)

For use with Ammonia, Freon, Methyl Chloride, Sulphur Dioxide

Available in operating ranges from 30" vac.-60 psig, to 50-350 psig, with differentials varying from 3½ psig to 14 psig (depending upon range selected.)

PROVIDES

- **External Adjustments**
- **Repetitive Trip Point**
- **Repetitive Reset Value**
- **Visible Calibrated Dial**
- **Visible Contact**

OTHER CASE STYLES AVAILABLE

listed by UL and CSA

GENERAL PURPOSE (NEMA 1) —for indoor use.
WEATHER-PROOF (NEMA 1A, 2, 3, 4,)— for outdoor use.

If UL or CSA *listed controls* are a must in your requirements be sure the *complete device* is listed. Check your local UL or CSA office or write to Mercoid for Bulletin SEB-26A for a complete listing of Mercoid Controls.

WRITE FOR CATALOG NO. 858

THE MERCOID CORPORATION

4205 BELMONT AVENUE

CHICAGO 41, ILL.

Refrigerated Trucks Tested For Performance

››› HAVING learned the most significant factor of road operation affecting refrigeration of truck trailers is air leakage into the insulated space, experts working to develop performance ratings now will turn to establishing laboratory conditions for simulating road air leakage. In charge of rating trailers at the National Bureau of Standards in Washington is P. R. Achenbach, who summarized for the annual convention of the Truck-Trailer Manufacturers Association in Palm Beach, Fla., in January, what has been done since July 1, 1957.

Heat transfer of three 35-foot commercial trailers tested thus far ranged from 8 per cent to 24 per cent greater when on the road at 50 miles per hour than when standing still in the laboratory with corrections made for comparable operating conditions of temperature and humidity. The TTMA method for rating developed by the NBS, was described as a simple procedure in which the unknown heat transfer of a trailer is compared with a known electrical heat load.

Aluminum Car Floors

››› TWO RAILROAD refrigerator cars are now in operation with all-aluminum floors. The cars are being used by Wilson Car Lines division of Wilson & Company. The aluminum floors were designed by Reynolds Metals Co., with the assistance of Wilson and Pacific Car & Foundry Co., which installed them at its Renton, Wash., shops.

Made from 10-in. wide extruded aluminum sections which interlock with a moisture-tight joint, the surface of each section has serrations which provide a non-skid floor. Interlocked sections of flashing at the side of the cars provide waterproofing protection 5¼ inches up from the floor.

Perishables by Air

››› AIR transportation specialists have long felt that speed in transporting perishables was a substitute for refrigeration. A recent study by J. M. Harvey of the Fresno Quality Maintenance Laboratory has proved this isn't true. In 24 hours, a simulated test shipment of precooled strawberries developed 30 percent decay at 70 F, 15 percent at 55, 10 percent at 45, and 7 percent at 34.

Although some planes have refrigerated cargo compartments, these are open when the plane is on the ground during stopovers. Exposure to 70 F air for 20 minutes will raise the temperature of a 12-pint crate of strawberries from 32 to 40 F.

PIPE BENDS • PIPE BENDS • PIPE BENDS • PIPE BENDS • PIPE BENDS • PIPE BENDS

Coils, Headers and Fabrications . . .

the tougher the job, the better our expert metalworkers like it. With their modern equipment, they produce the finest work to your precise specifications. In any metal, even stainless steel, or up to 6-inch extra heavy. For fast, quality bends, backed by nearly 40 years specialization, call on us!

May we quote on your next job?

CHICAGO NIPPLE MANUFACTURING COMPANY

1997 CLYBOURN

CHICAGO 14

Little Giant Model 90M

11 MODELS IN THIS LINE OF ICE BREAKERS FOR:

RESTAURANTS • HOTELS • AIR LINES RAILROADS • LABORATORIES • TAVERNS ICE PRODUCERS • PACKING HOUSES

The Little Giant Line has a long record of service to many types of users. These breakers are designed to break ice in rice to chestnut to 3" size and pea to chestnut to 4½" size. Hand and power operated. Write for details and prices.

LITTLE GIANT

DEPENDABLE ICE BREAKERS BY MICRON, INC., BETTENDORF, IOWA

Refrigeration People In The News :

Leo. J. Vivien

PAST National NAPRE President, Leo J. Vivien was appointed Chief Inspector, Mechanical Inspection Section, Dep't. of Safety and Permits, New Orleans, March 1958. Bernard J. McCloskey, Dep't. Director, made the announcement following appointment by Mayor deLesseps S. Morrison.

Vivien has been executive secretary of the Board of Examiners of Operating Engineers, New Orleans, 16 years. In his new position he is responsible for inspection of equipment and the enforcement of rules and regulations pertaining to smoke prevention and air polution; fuel gas, boilers, heating systems and unfired pressure vessels; air conditioning, heating and mechanical refrigeration; elevators, escalators and mechanical amusement devices.

Vivien is a member, ASRE, Engineers Club of New Orleans, Greater New Orleans Code Committee, Training Program Committee for the Delgado Trades School, and ASA Sectional Committee on Nomenclature. He is a registered professional engineer and holds first class licenses in steam, internal combustion and refrigeration.

K. V. Plummer

RECENT retirements brought about realignment of some aspects of Pacific Fruit Express Co. organization. K. V. Plummer, Vice-president and General Manager since October 1942, retired March 1958. He was succeeded as Vice-President and General Manager by Chas. Ahern.

Ahern's former position was discontinued and a new one of Assistant to Vice-President and General Manager created. L. D. Schley, formerly General Contract and Lease Agent, was advanced to this position.

Coincident with these changes PFE transferred jurisdiction of its 15 ice plants along the lines of its owners, Southern Pacific and Union Pacific, to Assistant General Managers, A. L. Holst in San Francisco and O. I. Larsen in Omaha; the plants on the SP going to the direction of Holst and those on the UP to Larsen. This action followed the retirement in February 1958 of Leroy Etzel, General Superintendent of Refrigeration, a position he had held since August, 1945. With transfer of direction of ice plants to Holst and Larsen, the position held by Etzel was discontinued.

Promotion of Robert F. McKee from position of Mechanical Engineer, to the newly created position of Assistant Chief Engineer was announced. McKee came to PFE in April 1946, and has advanced to his new position through various steps in the Engineering Department.

Plummer joined PFE Co., April 1922, as a clerk. He advanced rapidly through positions of Chief Clerk, General Agent, and Assistant General Manager. Ahern started 40 years ago as a clerk with PFE. He served successively as Car Distributor, Superintendent of Transportation and Assistant General Manager, from which position he was appointed Assistant Vice President & General Manager in February 1949.

VAN RENSSELAER
H. GREENE
ENGINEERS
COMPLETE PLANT DESIGNS INCLUDING BUILDING AND EQUIPMENT
11 PARK PLACE NEW YORK 7, N. Y.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

USED EQUIPMENT—wanted & for sale

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use **"QUICKSEAL"** — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois. WAbash 2-3299

FOR SALE — One 4 x 4 self-contained York; one 4 x 4 Frick; One 8 x 8 York $350.00. 3 ton blower. 20" x 10 ft. receiver. Write E. Niebling, 1546 St. Clair, Mt. Healthy, Cincinnati 31, Ohio.

HEADQUARTERS Whatever your requirements for ammonia compressors, condensers, receivers, etc.—or if you have any surplus equipment for sale, "Come to Headquarters". You will be happy with the way we do business. CHAS. S. JACOBOWITZ CORP., 3080 Main St., Buffalo 14, N. Y., Telephone AMherst 2100.

FOR SALE

9 x 9 York, 360 r.p.m. 100 h.p.
9 x 9 York duplex model D8, 360 r.p.m. 200 h.p.
7½ x 7½ York w/V-belt drive 50 h.p.
(2) 6 x 6 Yorks V-belt drive 25 h.p.
5 x 5 Frick w/evaporative condenser.
4 Cyl. Carrier type 7G8, 60 h.p.
(4) Carrier cold diffusers, floor mounted, 3 h.p. ea.
300 h.p. Westinghouse starter 4160 volts (new).

JOHN F. CARSON
A & VEnango St., Philadelphia 34, Pa.
GArfield 6-2221

PRICED FOR QUICK SALE

Two figure 3650 3" x 4"—7 Gould Centrifugal pumps. All iron fittings, couplings and mechanical seals. Original service: 480 GPM Ethlyne Glycol at 60 psi. 25 h.p. Westinghouse motors 3530 r.p.m., drip proof, 3 phase, 60 cycle, 480 volts. Suitable in any clear liquid service. Purhased 1954. Operated approximately 2 years. Very good condition. Red Owl Stores, Box 657, Green Bay, Wisc.

FOR SALE — Two York 9 x 9 with motors $900.00 each. Shell and tube condenser Vilter 4½ x 3½ Freon self contained, 15 h.p. motor, $750.00 Vilter 7 x 7 with motor $750.00; Creamery Package 5 x 5 self-contained $900.00. Gordon Equipment Co., 6530 W. Jefferson Ave., Detroit 17, Mich. Phone Vinewood 3-6630.

RED TOP BREWERY — CINCINNATI

For sale, all equipment, including Frick 9 x 9 ammonia compressor with G.E. 60 h.p. 220/440 volt, 3 phase, AC motor—2 York 100 ton each evaporative condensers—2 Vilter evaporative condensers; Carrier cold air diffusers, etc. Inspection invited, or write to Red Top Brewery, 242 W. McMicken Ave., Cincinnati, Ohio.

FORT PITT BREWERY — PITTSBURGH

Complete plant for sale, including 3 Frick 160-ton each evaporative condensers, installed new 1955; Vilter 10½ x 10½, 2 cylinder ammonia compressor with Westinghouse 125 h.p. 60/220 3-phase, 275 r.p.m. motor, panelboard controls, all condensers, receivers, ammonia pipe, room blowers, valves, fittings; everything erected as last used in November. Write for free 16-page, 2-color illustrated catalog. Fort Pitt Brewery, Sharpsburg, Pa., Telephone STerling 1-2300.

FOR SALE

Steam mixed pressure bleeder turbine with condenser; Terry turbine type GZF8 1949 rated 800 h.p. at 4100 r.p.m. with 140#-30#-20" vacuum. Worthington surface condenser for above turbine 1010 sq. ft. in Admirality tubes, over all size 39½" x 14'2". Turbine driven York VW ammonia compressors consisting of 400 h.p. DeLaval steam turbine type MCA and DeLaval direct connected gear reducing unit on common bed plate. 4540/720 r.p.m. with rubber shear couplings driving two York 6¾ x 5 eight cylinder ammonia compressors, complete with ammonia oil separators and oil return traps, plus ample spare parts and panel board with automatic air controlled system. Original installation June 1951. Compressors rated 250 tons ammonia. Over all floor space 7½' x 20'. Can be seen in place at:

P. Ballantine & Sons
57 Freeman St. Newark 1, N. J.

FOR SALE

1—7 x 7 Frick air compressor with oilers S#43700 35 h.p., 720 r.p.m., 2 ph., 60 cy. 220 V. General Electric motor.

1—7 x 7 Frick air compressor with oilers S#41253 Burke Elec. Co., 25 h.p. 900 r.p.m. Type EMV-3, 2 ph., 60 cy., 220 V.

1—9 x 9 Frick ammonia compressor with oilers Westinghouse motor, type CW., 100 h.p., 695 r.p.m., 2 ph., 60 cy., 220 V.

3—40 ton Frick evaporative condensers S#2702A 2 h.p. fan motor—40 G.P.M. pumps each ¾ h.p.
Approx. 4400 ft. 2 in. heavy duty ammonia coil. Approx. 8,000 ft. 1¼ in. heavy duty ammonia coil.
20 sections 5 bend (24 in.) 33 to a section 1¼ in. refrigerating coil.

1—1,100 gallon upright stainless steel insulated tank with hinged covers connections for ammonia refrigeration, dimensions approx. 76 in. diam. x 77 in. high on 15 in. racks. Ammonia chilled agitator.

Above offered subject to prior sale.

GOLD MEDAL PACKING CORP.
614 Broad St., Utica, N. Y.
Phone 2-5146

not a plaster
not a paint
...it's a
NEW
CONCEPT
in industrial
wall finishes
by...

• It's not a plaster . . . not a paint. Swift's Adcote wall finish was especially developed to provide industrial users with a high moisture resistant finish that is easy to apply yet has good adhesion to many different surfaces and presents a clean, white, uniform appearance.

You can use it over board type insulation or masonry surfaces. Use it on cooler walls, concrete, brick, concrete block or even apply it to damp surfaces. It shows good adhesion to many surfaces as tested by Swift and it offers chemical, rodent, vermin, and mold resistance.

Adcote finished walls are fire retardant and fully washable. Adcote is supplied as a dry powder and a liquid which are mixed together prior to use. Though usually trowelled on, spray or brush can be used.

A trial in your own plant is the best way to prove the superiority of this new Swift concept in wall finishes. Return the coupon for details on a trial order today.

ONE TRIAL IS BETTER
THAN A THOUSAND CLAIMS

Swift
103RD YEAR

To Serve Your Industry Better

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Adhesive Products Department
Chicago 9, Ill.

☐ Send descriptive bulletin.
☐ Send information on trial order.

Name_____

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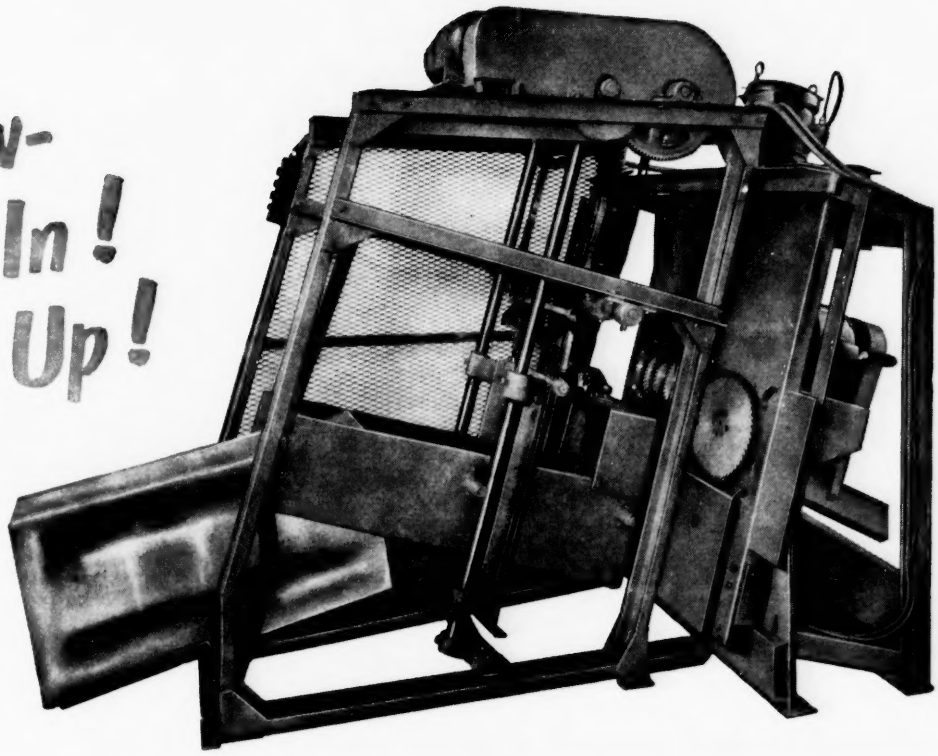
Now-
Trade In!
Trade Up!



Up to 24 months to pay on Gifford-Wood's famous Type CA cuber

GET THIS NEW 26,000-AN-HOUR CUBER WITH G-W'S GREAT NEW TRADE-IN DEAL!

Here's a top deal that can increase your ice cube volume overnight! Think of the extra business you'll handle... the reduced labor and handling costs you'll have... and the years of trouble-free service you'll get with a new Gifford-Wood Cuber in your plant.

And the best news is G-W's generous trade-in offer! Turn in your old G-W Cuber – it serves as your down payment. Then take up to 24 months to pay with G-W's new and easy Pay-Way Plan! You're earning big profits while your G-W pays for itself by turning out up to 26,000 perfect ice cubes an hour.

G-W's Type CA Cuber is specially designed to eliminate ice waste. As soon as the first cake is ¾ cut, the second cake slides easily into place, pushing the remaining quarter into the saws. And every part of the cuber that touches the ice is not only sturdy, but completely corrosion-proof. Maintenance costs are rock bottom.

Write today for a Bulletin which fully describes this advanced Type CA... and let a G-W representative tell you just how much you'll get when you trade in your old G-W Cuber. (You'll be pleasantly surprised!) And if you're just coming into the market for a large-volume cuber, why not find out how a low-cost, *completely reconditioned* G-W Cuber can build up business – *fast!* For even if you don't have a cuber to trade, you may wish to take advantage of G-W's terms!

1821

GIFFORD-WOOD CO.
Hudson, N. Y.

New York 17
420 Lexington Avenue

St. Louis 1
Railway Exchange Bldg.

Cleveland 20
3537 Lee Road

Chicago 6
565 W. Washington St.

Pacific Coast Representative:
Western Ice Equip. Co., 420 Market St., San Francisco 11

Scorers, Breaker-Elevators, Conveyors, Breakers, Tools and all types of ice handling equipment.

GIFFORD-WOOD CO., Hudson, N. Y.

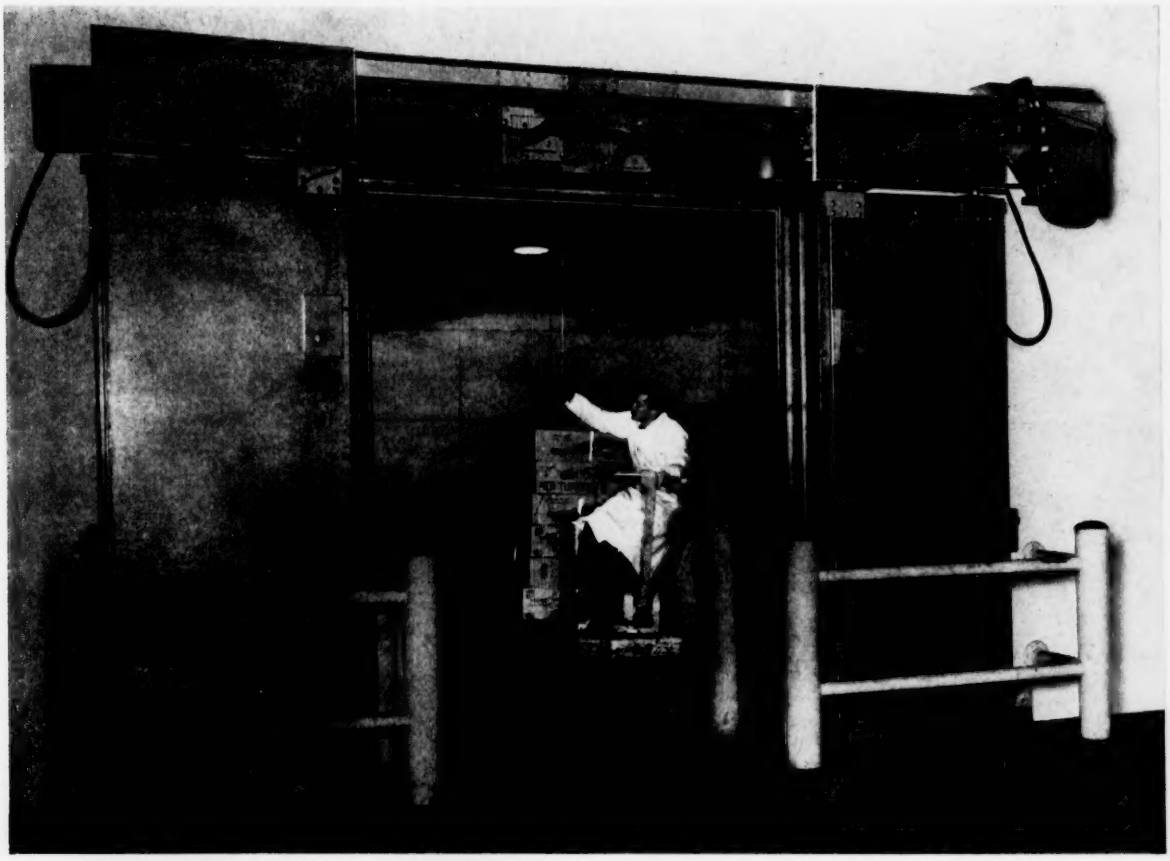
☐ Send me your Bulletin on G-W Cubers.
☐ Ask a G-W Representative to call with full information on your proposal at no obligation to me, of course.

Name_____

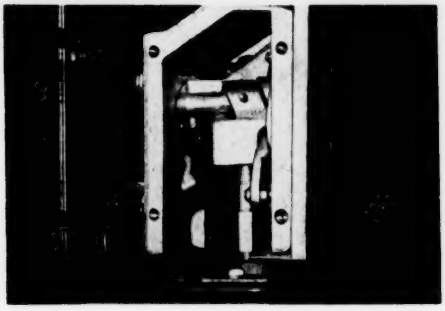
Address_____

City_____ Zone____ State_____

New Jamison *Electroglide** Power Door speeds traffic, saves refrigeration *automatically!*



Electroglide offers famous Jamison Cold Storage Door quality and performance plus a completely new design for power operation. Both bi-parting and single leaf Electroglides are available to meet all job requirements.



EXCLUSIVE CAMLOK COMPRESSION SEAL—Jamison Camlok cams doors "in" against frame and "down" against floor at all points.

These other exclusive features mean dependable, smooth operation.

SHOCK ABSORBER CHAIN LINK—reduces wear and tear

SPRING LOADED SUSPENSION—minimizes power requirements

IMPROVED SAFETY EDGE—sensitive full height and full travel of door

SEALED-IN-OIL REDUCTION GEAR—trouble-free operation, minimum maintenance

High volume traffic can now speed on its way in busy cooler and freezer operations with minimum loss of refrigeration. Electroglide is specifically designed to accelerate truck movement with its instant automatic opening and closing.

Rapid smooth opening—Spring suspension helps doors open easily and smoothly. Doors move "out" and "up", riding on level tracks with gaskets clear of sill and frame.

Electroglide is made for both cooler and freezer use. Write today for new Electroglide bulletin to Jamison Cold Storage Door Co., Hagerstown, Md.

*JAMISON TRADEMARK

JAMISON

COLD STORAGE DOORS